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Improving Pedestrian Mobility in Newton, MA

Caitlyn Elizabeth Shaddock
Worcester Polytechnic Institute

Cory Scott Alemian
Worcester Polytechnic Institute

Jeffrey A. Greenwood
Worcester Polytechnic Institute

Michael Leo Oliveri
Worcester Polytechnic Institute

Walk Newton

A Study of Pedestrian Mobility in Newton, MA

by Cory Alemian, Jeff Greenwood, Michael Oliveri, Caitlyn Shaddock

Walk Newton:

A STUDY OF PEDESTRIAN MOBILITY IN NEWTON, MA

AN INTERACTIVE QUALIFYING PROJECT SUBMITTED TO THE FACULTY OF
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Cory Alemian

Jeff Greenwood

Michael Oliveri

Caitlyn Shaddock

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Report Submitted To:

Chrysanthe Demetry and Richard Vaz, WPI

Lucia Dolan, League of Women Voters, Newton

David Koses and Ben Solomon-Schwartz, Planning and Development, Newton

Abstract

The goal of this project, sponsored by Newton's Planning and Development Department and League of Women Voters, was to recommend improvements for greater pedestrian mobility in four of Newton's villages. We identified challenges facing mobility and the opportunities for increasing mobility in each area by assessing conditions, observing pedestrians, and interviewing residents. We present recommendations for improving conditions of facilities including sidewalks, crossings and signals, in each area and for the city as a whole.

Executive Summary

Pedestrian mobility, defined as safe and accessible travel on foot, is an important issue for communities that can provide many benefits, including increased safety, closer neighborhoods, decreased pollution, improved health, and more business for commercial venues.

The Newton League of Women Voters and the city's Planning and Development Department commissioned this project because they agree that pedestrian mobility is an important goal. We conducted a study in the villages of West Newton, Newton Corner, Newton Centre, and Chestnut Hill. Our goal was to provide the city of Newton with recommendations for improvements in pedestrian mobility within these four villages. Our objectives were to identify areas for improvement, develop recommendations based on past studies, and create prioritized recommendations.

We developed assessment methods based on previous studies by the Boston Metropolitan Planning Organization, and San Diego's Regional Planning Agency, SANDAG, as well as regulations from the Americans with Disabilities Act. We assessed facilities such as sidewalks, crossings, and walking signals by visual inspection, pedestrian observations, and interviews of stakeholders. Next, we developed recommendations, drawing on examples of best practices. Finally, we grouped them into two categories, short-term and long-term recommendations. Short-term recommendations have low costs and can be implemented relatively easily, without much planning, while long-term recommendations are more costly and may require further study and planning to be implemented.

The following recommendations presented are those categorized as short-term and long-term. These recommendations are those that can have an immediate impact on pedestrians mobility once implemented.

West Newton Short-Term Recommendations

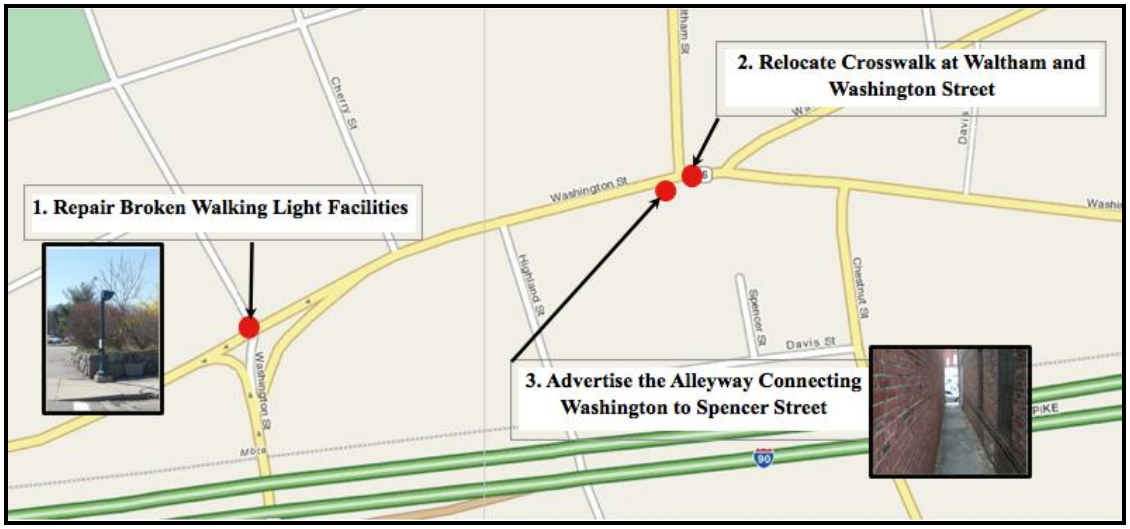

Figure 1: West Newton Short-Term Recommendations

1. **Repair broken walking light at the intersection of Elm and Washington Streets.** This light is not visible to pedestrians and the button is not working.
2. **Relocate crosswalk at Waltham and Washington Streets.** This crosswalk should be moved from one side to the other which will provide refuge for pedestrians and avoid hazardous right-on-reds.
3. **Advertise the alleyway connecting Washington and Spencer Streets.** Improving the alley's aesthetics and advertising its public use with signage could cut a pedestrian's commute significantly and allows access to shops along Spencer Street.

West Newton Long-Term Recommendations

1. **Make West Newton's commuter rail stop accessible to all persons.** Newton must contact and request from the MBTA that one of three commuter rail stops in Newton become handicap accessible in order to allow the use from all persons.
2. **Re-time traffic signals in on Washington Street.** Re-timing the lights will improve traffic flow, helping prevent cars from backing up onto crosswalks.

Newton Corner Short Term Recommendations

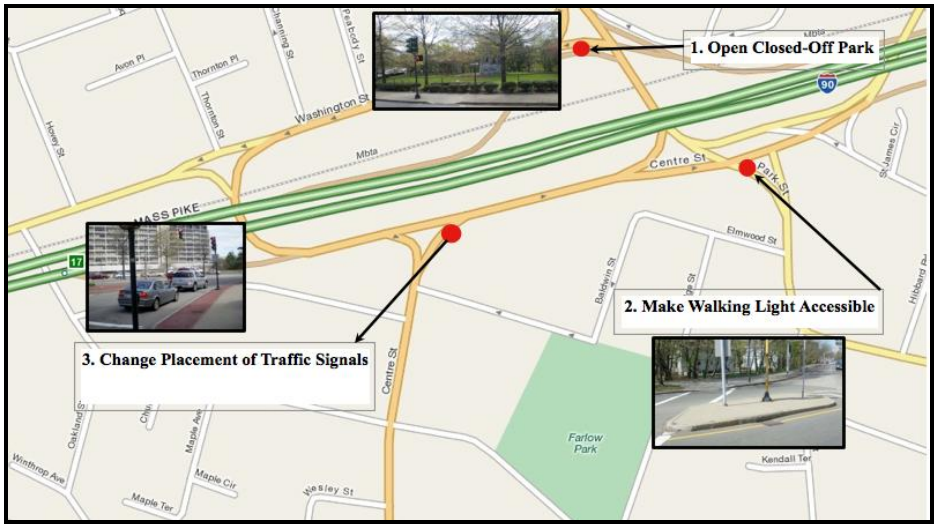

Figure 2: Newton Corner Short-Term Recommendations

- **Open closed-off park.** Opening this park would provide a safe and inviting destination that separate motorists from pedestrians.
- **Make walking light accessible.** An accessible walk light at the intersection of Park Street and Centre Avenue will provide a safe and accessible means of travel, especially for the children using this area as a route to school.
- **Change placement of traffic signals.** Changing the placement of traffic signals will result in cars stopping before the crosswalk instead of on top of it, decreasing the interaction time between motorists and pedestrians, increasing safety.

Newton Corner Long-Term Recommendations

1. **Install handicap ramp at Crowne Plaza Hotel.** Installing a handicap ramp will be expensive and require planning in conjunction with the Massachusetts Department of Transportation; however this will greatly increase accessibility in this area.

Newton Centre Short-Term Recommendations

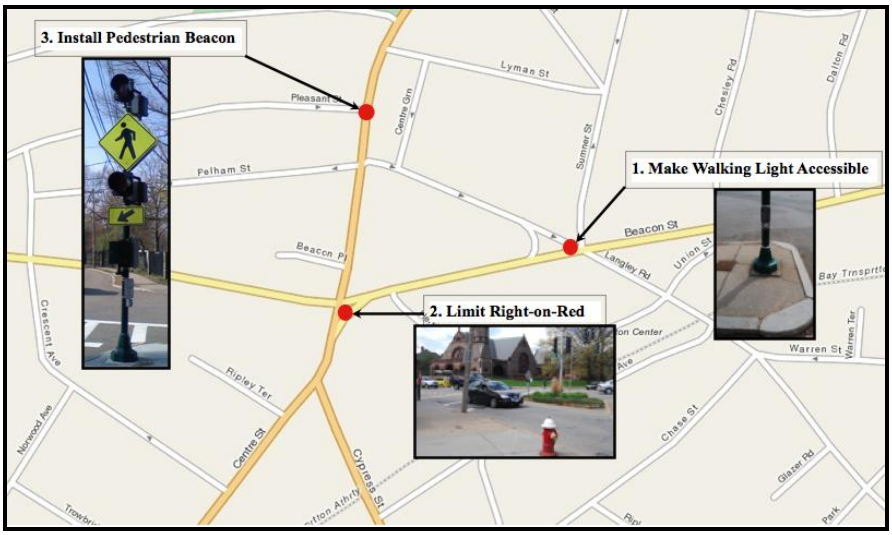

Figure 3: Newton Centre Short-Term Recommendations

1. **Make walking light at Beacon Street and Langley Road accessible.** This walking light is located on a median which currently possesses no curb cut, making the walking light inaccessible to disabled persons.
2. **Install No-Turn-on-Red signal at Beacon and Centre Streets.** Motorists taking this turn at high speeds endanger pedestrians when using the walking light. Despite the safety that these lights provide, motorists taking the right-on-red often do not yield or see pedestrians attempting to cross.
3. **Install pedestrian beacon where Pleasant and Centre Streets.** A pedestrian beacon aids a pedestrian when traveling in a crosswalk; they make motorists more aware of the pedestrians in the area.

Newton Centre Long Term Recommendations

1. **Install a curb extension at Langley Road and Beacon Street.** This location is effectively a median with curb cuts at an incline too steep for people with disabilities. Installation of a curb extension will reduce the length of the crosswalk and will allow the incline of the curb cuts to be reduced.

Chestnut Hill Short-Term Recommendations

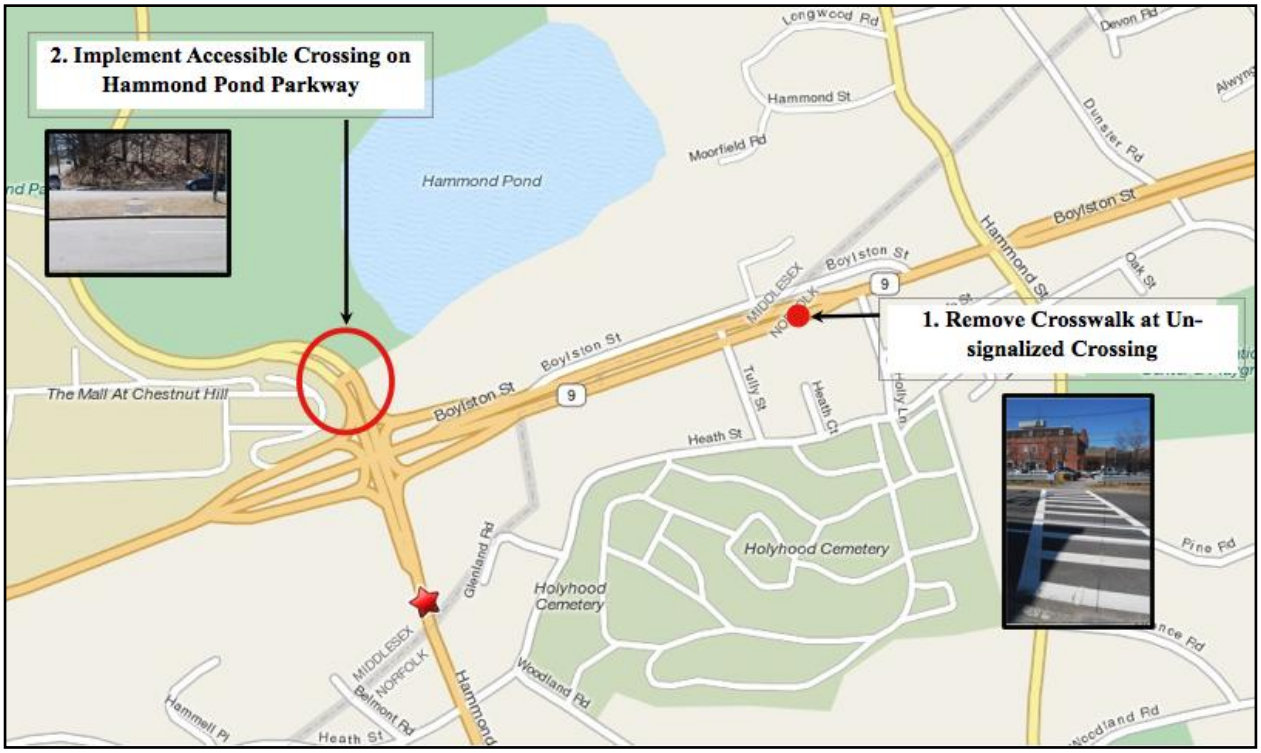

Figure 4: Chestnut Hill Short-Term Recommendations

1. **Remove un-signalized crossing on Route 9.** Located on Route 9, roughly 80 meters east of Tully Street, is a crosswalk that has no traffic light or walking light. By removing the crosswalk, it would prevent pedestrians from putting themselves in harm's way when trying to cross this dangerous state road.
2. **Implement accessible crossing on Hammond Pond Parkway.** Crossing this road is unsafe and implementing a crosswalk would increase driver awareness here.

Chestnut Hill Long-Term Recommendations

1. **Install a traffic signal and walking light at un-signalized crossing on Route 9.** Installing a traffic signal and walking light will increase the safety of pedestrians wishing to cross Route 9. This recommendation will require cooperation from Brookline.
2. **Redesign pedestrian facilities along Hammond Pond Parkway.** Redesigning pedestrian facilities at the intersection of Hammond Pond Parkway and Route 9 would make this area much safer for pedestrians by providing means of travel that avoid interactions between pedestrians and motorists.

Citywide Recommendations:

- **Replace brick walkways with pressed concrete.** Brick can be a hazardous surface therefore as it degrades, pressed concrete should be used as a replacement.

- **Improve crosswalk painting.** Hatching or solid colors should be used to improve visibility and therefore the safety of pedestrians.
- **Improve bus stops.** At bus stops, where able, full shelters and bike racks should be added to encourage the use of these stops.
- **Install curb cuts for each crosswalk.** ADA recommends each crosswalk must have its own curb cut, rather than sharing it with another crosswalk.
- **Install perpendicular crosswalks.** Diagonal crosswalks cause longer interaction time between motorists and pedestrians. Curb cuts should be installed in order to allow a straight crosswalk for pedestrians.
- **Install at crossings longer than 50 feet to avoid long crosswalks.** Installing medians at crosswalks that are long will provide safety for pedestrians by allowing a place in the middle of the crosswalk to separate the pedestrian from vehicular traffic.
- **Limit right-on-reds.** There are three ways to limit the challenges presented by right-on-reds: eliminating the right-on-red turn, installing a "No Turn on Red" traffic signal, or implementing leading interval lights. Any of the three can be applied to limit conflicts between motorists and pedestrians.
- **Earlier seasonal maintenance of sidewalks and crosswalks.** Maintaining facilities earlier in the spring will minimize the time that debris and poor visibility affect safety and accessibility in Newton.

Authorship Page

The main authors listed wrote the original draft material. In many cases, the titles of the chapters are not those that the author initially chose. Each chapter and its parts have been passed revised and edited by all group members and each of us has contributed something to each section. In some cases, no single author can be defined.

Abstract - Main Authors: Mike and Jeff
Executive Summary - Main Author: Mike and Cory
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- **2.2 Infrastructure of Pedestrian Mobility -** Main Authors: Mike and Cory
- **2.3 Transportation and Pedestrian Mobility in Newton, MA -** Main Author: Caitlyn

3 Methodology - Main Authors: All
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- **4.1 Chestnut Hill -** Main Author: Caitlyn
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Appendix A: ADA Regulations - Authors: Cory
Appendix B: Pedestrian Infrastructure ID Forms - Authors: Caitlyn, Cory, Mike
Appendix C: Observation ID Forms - Authors: Caitlyn
Appendix D: Interview Summaries - Authors: Mike
Appendix E: Summative Teamwork Assessment – Authors: All

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Lastly, we would like to thank our advisors for this project, Chrysanthe Demetry and Richard Vaz, from Worcester Polytechnic Institute. Their insight and feedback on all drafts allowed our project team to remain on task and stay within the scope of the project.

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1 Introduction

A community that promotes walking for transit often reaps many benefits. Walking can be considered "sustainable travel," allowing for a reduction in emissions and making the area more "green". Walking is also considered the best overall physical activity for maintaining and improving fitness and health, since it requires little skill or special equipment (Tolley, 2003). Walking has social benefits that allow residents to interact with one another, improving relationships with neighbors and creating a sense of community (Tolley, 2003). Walkable communities have easy access to shops, grocers, restaurants, and other amenities, promoting more economic activity.

Communities can be made pedestrian friendly through safe and accessible *pedestrian facilities,* defined by the Federal Highway Administration as any pedestrian related infrastructures such as sidewalks and crosswalks. When facilities are properly maintained they can offer mobility, which promotes walking as an alternative for motorized transit. However, when an area lacks pedestrian mobility, many will choose not to walk and seek another form of transit. Increased mobility can be promoted through improving the conditions of pedestrian facilities or building new ones. Pedestrian improvement projects are becoming more common across the United States as a key element of transportation planning. Some of these include projects organized by The San Diego Association of Governments (SANDAG), The Federal Highway Association (FHWA), and Boston's Metropolitan Planning Organization (MPO).

Members of the Newton community have hopes to develop many of its village centers into environments that are more accommodating for pedestrians. Currently, Newton is considered a "commuter suburb." Many residents travel by car, bus, and train in order to get from place to place. In an attempt in increase pedestrian mobility, many studies have already been conducted (The Newton Center Task Force, Newton Corner Study, MIT student study, West Newton Washington and Watertown), but pedestrian challenges remain. The city has brought four of Newton's villages to our attention: Newton Centre, Newton Corner, Chestnut Hill, and West Newton, in the hope that, by improving these areas, the city will be able to reap the benefits that come with being a walkable community.

The goal of this project was to provide recommendations to improve pedestrian mobility in these four villages of Newton. In order to improve pedestrian mobility, we determined what limits mobility in each area and what opportunities each area presents to increase mobility. This assessment was done in three ways: through visually assessing each area, by observing pedestrian behavior in each area, and through conducting interviews with members of the Newton community. Using the data collected through these processes, we generated two sets of recommendations based on ideas from transportation experts and residents: those which are low-cost and easy to implement, and those which are high-cost, but will have long-term benefits in the community. Finally, we presented our findings and recommendations to our sponsors and the residents of Newton.

2 Background

In this chapter, we will describe the benefits of pedestrian mobility and the different challenges faced when improving pedestrian mobility. These challenges include identifying the physical improvements needed and the planning necessary to implement them. Also we will discuss Newton, MA's current transportation systems and the four study areas that we will focus on during our study.

2.1 Promoting Pedestrian Mobility

In this section, we discuss the importance of walking and the benefits of non-motorized mobility on the individual and a community as a whole. In recent years, many studies have been conducted on promoting more pedestrian friendly environments. This is because over time many urban areas have become dangerous to pedestrians. Originally, in New England most urban areas were built before the automobile so destinations were all within walking distance (Boston's MPO, 2010). However, over the years the automobile has advanced greatly forcing places to become more accommodating to vehicular traffic and in turn creating less welcoming environments for pedestrians.

Promoting walking for transit is difficult because walking has been displaced by vehicular transit. Rodney Tolley, in a 2009 report on pedestrian mobility in Victoria, Australia, concluded that roads are more accessible for vehicles than for pedestrians, and vehicles are faster, more comfortable, more convenient, and provide a sense of privacy and safety (Tolley, 2003). However, vehicles have drawbacks which have become more noticeable as streets have become congested with vehicular traffic. Cars are a major contributor to air and noise pollution, they cause congestion, and present dangerous situations due to vehicular accidents. These factors have made promoting pedestrian mobility important in today's society.

Pedestrian mobility benefits an individual's health and safety. Walking is a healthy, simple form of exercise available to nearly everybody. Walking is often linked to reductions in heart disease, diabetes, osteoporosis, colon cancer, obesity and depression (Tolley, 2003). According to Tolley, it can be said that the years added to a person's life through the benefits of walking outweigh the risk of the years that could be lost in crashes (Tolley, 2003). Also, a city or community in which many of its citizens walk provides a sense of security and safety for those who would otherwise be afraid of crime on the streets (Tolley, 2003).

According to Boston's Metropolitan Planning Organization walking and other non-motorized mobility is "vital to a healthy community" (Boston's MPO, 2010). A healthy community with good pedestrian facilities also gains many benefits when its residents walk. When walking is used as an alternative to driving, there is a reduction of pollution and congestion caused by street traffic (Elvik, 1999).

Along with these environmental benefits, walking can help a community's economy and contribute to community life. Pedestrian mobility can help areas economically through increased pedestrian activity in front of businesses and storefronts (Boston's MPO, 2010). While increased walking within a community will often reinforce relationships with neighbors, busy streets flooded with traffic often divide neighborhoods and discourage many from walking to different parts of their community. As stated by Allan B. Jacobs in *Great Streets*:

"[Y]ou don't meet other people while driving in a private car, nor often in a bus or trolley. It's on foot that you see people's faces and statures and that you meet and experience them. That is how public socializing and community enjoyment in daily life can most easily occur. And it's on foot that one can be most intimately involved with the urban environment; with stores, houses, the natural environment, and with people" (Jacobs, 1993).

2.2 Infrastructure for Pedestrian Mobility

Pedestrian facilities are infrastructure that allows pedestrians to travel safely and effectively. In order to assess and analyze aspects of pedestrian mobility in Newton, we sought to understand how pedestrian facilities should be built and in what additional ways pedestrian mobility can be increased. This section discusses these factors.

2.2.1 Elements of Effective Sidewalks

Towards the end of the nineteenth and beginning of the twentieth century, sidewalks were used for social, commercial, and political activities. In modern day, the sidewalk is used as a mode of transportation for pedestrians. Its purpose is to serve as a pathway for pedestrians and provide safe and even passage for all people. Safety and accessibility for pedestrians using sidewalks can be increased when improvements and repairs are made to sidewalks (Knoblauch, 1987). There are many agencies and regulations that provide guidelines for sidewalk design and maintenance [(FHWA, 1998) (SANDAG, 2002) (ADA, 2000)]. In this section, we discuss the important aspects of sidewalk design and maintenance presented by these agencies.

Sidewalk widths should be wide enough to allow pedestrian traffic to flow easily and safely. However, sidewalks can be built with a greater width to increase the buffer zone between the pedestrian and vehicles (International Scan Summary Report on Pedestrian and Bicyclist Safety and Mobility, 2009). The regulations for designing and maintaining sidewalks are presented below are provided by the ADA (See Appendix A for additional regulations) (SANDAG, 2002) (ADA, 2000):

- Minimum Width of 4 ft- General Areas
- Minimum Width of 8 ft – Commercial Areas
- 10 ft x 5 ft passing point every 200 ft
- Resting areas for sidewalks with slopes exceeding 5% at every 400 ft
- Must be kept clean of any obstructions, including snow
- Maximum width of Cracks/ Gaps is ¼ in.
- Ramps are required for changes of levels greater than ½ in.

According to the Federal Highway Administration (FHWA), the existing conditions of pedestrian facilities, such as sidewalk conditions, should be evaluated in order to find potential

improvements and maintain mobility for pedestrians. Maintenance of sidewalks is required in order to reduce the amount of damage done due to use and weathering. Conditions of pedestrian facilities that inhibit pedestrian mobility included (FHWA, 1998):

- Cracking
- Broken concrete
- Settled areas that trap water
- Tree root damage
- Spalled areas, where material is detached from the sidewalk

For example, people with wheelchairs or strollers may find it difficult or impossible to travel on uneven sidewalks. Uneven sidewalks could also cause a tripping hazard, especially for those with difficulty walking, such as some elderly or visually-impaired.

To help keep sidewalk conditions maintained, many cities leave the responsibility of keeping sidewalks in good condition to the adjacent land owners, giving them the responsibility to inform city officials so they can hire contractors to make improvements. They are also responsible for snow removal and subtle improvements, such as sweeping the sidewalk and keeping it clean from trash and dirt (FHWA, 1998).

2.2.2 Pedestrian Crossings

Crosswalks provide a simple way for pedestrians to travel from one side of the street to the other. If crosswalks are maintained and used properly, they also offer a safe means of crossing a street. In Massachusetts, when driving a motor vehicle, it is unlawful to pass a pedestrian attempting to use a crosswalk (Marked Crosswalks, N.D.).

The requirements for constructing and maintaining crosswalks are also described by the ADA. Other regulations are in place for guidance on painting crossings. These regulations are presented below (SANDAG, 2002) (ADA, 2000):

- Medians should be at least six feet long
- Recommends the use of tactile warnings such as wayfinding strips, and tactile bumps
- Tactile warnings are a "change in surface condition providing a tactile cue to alert visually impaired pedestrians of a potentially hazardous situation" (SANDAG, 2002).
- Wayfinding strips are grooves that lead can a visually impaired pedestrian through a crosswalk while tactile bumps
- Sand should be added to paint to increase slip resistance
- Routinely painted (Sasidharan et. all, 2009)
- Repainting should take place in the spring

There are many potential problems associated with walking lights, which signal to a pedestrian when it is safe to cross a street. However, if properly installed and maintained, they can effectively help pedestrians cross safely. One fault is insufficient time given to cross a street safely. The average person walks approximately 3.5 feet per second (Boston's MPO, 2010), and appropriate time is needed to allow a pedestrian walking at this speed to cross the road. If the light were to change while a pedestrian was using the crosswalk, it would put the pedestrian in harm's way of vehicular traffic. Additionally, ineffective light timers do not account for road conditions, weather conditions, and handicap accessibility, which all increase the time needed to cross a street. Walking lights can also be placed in a way that can inconvenience pedestrians. A walking light should be within reach of the curb cut, and if it is not, many may not have enough time to cross or even reach the walking light at all.

Curb cuts are ramps that allow an even transition from the street to the sidewalk. To allow ease of walking, the ADA requires curb cuts to be a certain grade, or slope, and be accessible at all times (SANDAG, 2002) (See Appendix A). The asphalt of the road must be maintained in order to ensure pedestrians a flat smooth surface with which to safely cross.

Another safety concern facing pedestrians at crosswalks is poor visibility from motorists. In order to develop an effective crosswalk, the area must be clearly marked so drivers are able to recognize pedestrians from a distance so yielding to them will not be a concern (Redmon and Boodlal, 2003). In order to ensure safety, both crosswalks and pedestrians must be visible from a proper stopping sight distance. This distance can be calculated based on vehicle speed, and typical reaction time and braking deceleration and is the distance it takes a motorist to stop from the time an obstacle is seen. A motorist may not have ample time to yield if crosswalks are not visible or if pedestrians are not seen until entering a crosswalk. Therefore, crosswalks should be routinely repainted to ensure visibility (FHWA, 1998).

Pedestrians entering crosswalks must also be visible to motorists. This means that parking of motor vehicles should be limited near the intersection or crosswalk. Vehicles at intersections can inhibit a driver's ability to see pedestrians attempting to use crosswalks, as well (FHWA, 1998). Traffic signals and signs can be strategically placed to notify drivers of pedestrian crossings (International Scan Summary Report…, 2009).

Many forms of *pedestrian beacons* have been studied by the FHA. Pedestrian beacons are pedestrian activated flashing yellow lights warning oncoming traffic of a pedestrian crossing. These beacons can help alert drivers early enough to see and react accordingly to a pedestrian

using the beacon. The FHA has conducted numerous studies determining that pedestrian beacons are generally effective in increasing the number of vehicles yielding to pedestrians.

Vehicles taking *right-on-red*, which allow drivers to make a right hand turn after a full stop at certain red traffic light signals, often interfere with pedestrians attempting to use a crosswalk. A motorist making a right-on-red who does not see a pedestrian crossing places the pedestrian in harm's way. To avoid this often dangerous interaction between pedestrians and vehicles, many cities implement "No Turn on Red" signs at troublesome intersections, which should be well-marked in order to ensure the safety of pedestrians (FHWA, 1998). An alternative to this signs are "No Turn on Red" signals only illuminated when a pedestrian is given the signal to cross. The Federal Highway Administration has conducted many studies on the effectiveness of various limitations that can be applied to rights-on-red. These studies concluded that "No Turn on Red" signals are often more effective than signs. Permanent "No Turn on Red" signs often cause traffic to back up and are ineffective unless placed in a highly visible area. "No Turn on Red" signals showed a higher percentage of vehicles obeying the regulation than signs suggesting that these resulted in a higher visibility.

2.2.3 Traffic Calming Measures

Pedestrians often avoid areas that incur high traffic volumes because they are perceived as being unsafe due to traffic dangers. These include areas with high accident rates, high speed limits, or limited pedestrian facilities. In 2008, according to the National Highway Traffic Safety Association (NHTSA), in the United States there were over 69,000 pedestrians injured in traffic crashes. In addition to these injuries, 72% of pedestrian fatalities occurred in urban areas that exhibit traffic dangers (NHTSA, 2008). These areas affect pedestrian safety and accessibility in several ways. They prevent safe access to pedestrian facilities and, because of this, many pedestrians avoid walking in areas with these dangers.

The Federal Highway Association states that "when pedestrians and bicyclists are a common element in the street environment, motorists will expect their presence and take the necessary precautions at potential conflict points" (International Scan Summary Report…, 2009). Since traffic calming measures make pedestrian facilities visible "common elements", these measures will help motorists take the necessary precautions to account for possible encounters with pedestrians.

Traffic calming measures have proven to be one of the most effective methods when dealing with traffic danger. Traffic calming refers to the slowing of vehicle traffic, which helps promote the improvement of pedestrian mobility (U.S. Traffic Calming Manual, 2008). This concept has been widely adopted by other countries, including Sweden, Denmark, Germany, Switzerland, and the United Kingdom (International Scan Summary Report…, 2009). In these countries, as stated by the International Scan Summary Report on Pedestrian and Bicyclist Safety and Mobility, once traffic calming strategies were established and put into action, the amount of pedestrians traveling increased (International Scan Summary Report…, 2009).

One way to "calm traffic" is to lower speed limits. However, there are a number of other methods that can calm traffic which, in turn, will improve pedestrian mobility.

1. **Street Narrowing:** Street narrowing is a concept that is commonly used for traffic calming (U.S. Traffic Calming Manual, 2008). By narrowing streets, motorists are less apt to travel at high speeds, allowing for safer situations for pedestrians.

2. **Automatic Camera Enforcement (Figure 9):** Mounted mainly at intersections, automatic cameras photographs vehicles violating traffic laws, such as running red lights and traveling above the posted speed limit. Once the camera takes a photograph of the offending vehicle's license plate, a ticket is issued to the driver through the mail. This supplements the local police presence and makes drivers more aware of their surroundings (International Scan Summary Report…, 2009).

Figure 5: Automatic Camera Enforcement

3. **Raised Crosswalks (Figure 10):** Raised crosswalks are sections of raised pavement, similar to a speed bump, with crosswalk markings that allow pedestrians to cross a street. These provide a level street crossing for pedestrians, allowing them to be more visible to motorists. They also force motorists to slow their vehicle, which makes the motorist and pedestrian more aware of traffic laws (FHWA, 1998).

Figure 6: Raised Crosswalk

2.3 Transportation and Pedestrian Mobility in Newton, MA

Many residents consider Newton a city designed for vehicles. Interactions between pedestrians and vehicles in Newton tend to cause pedestrians to yield to the vehicle. Newton's goal is to reverse this tendency by creating areas designed for pedestrians, in which vehicular traffic will watch for pedestrians. In this section, we will discuss Newton and the transit throughout Newton to explain why Newton is currently so vehicle-oriented. We will then discuss characteristics of each study area in Newton.

2.3.1 Transit Routes in Newton

Newton is the beneficiary of a long history of transportation improvements. In 1834, the Boston-Worcester Railroad was built to link the two cities; this link now supports Auburndale, West Newton, Newtonville, and Newton Corner. The Charles River Railroad passes through Chestnut Hill, Newton Centre, Newton Highlands, and Newton Upper Falls. The Highland Branch connects Newton Highlands with Auburndale, currently known as the Riverside Line of the MBTA Subway Green Line. As part of former President Roosevelt's Work Progress Administration, the state's Boston-Worcester Turnpike, known today as Route 9, became a four lane turnpike with many grade separations. In the 1950's, Route 128/Interstate 95 was created just outside of Boston and on Newton's western border, and in the 1960's, the Massachusetts Turnpike was extended along the Boston-Worcester Railroad in order to accommodate express buses and commuters traveling from Boston to its various suburbs (MCPAC, 2007).

Since the 1960's, Newton has not had any major transportation improvements and traffic congestion has been steadily increasing. The increase in car travel from various suburbs to and from Boston has resulted in heavy traffic volumes of approximately 150,000 vehicles per day along I-95, 100,000 along the Mass Pike, and 50,000 along Route 9 (MCPAC, 2007). Increased

traffic and congestion can be a safety concern for pedestrians because many pedestrian-related accidents involve vehicles in urban areas (SANDAG, 2002). Newton has also become less pedestrian friendly because many Newton village centers, which used to have their own schools, grocers, and other amenities, no longer have these services. This results in forcing people to drive outside of their neighborhoods to access such amenities when they once could walk (MCPAC, 2007).

2.3.2 Areas of Focus

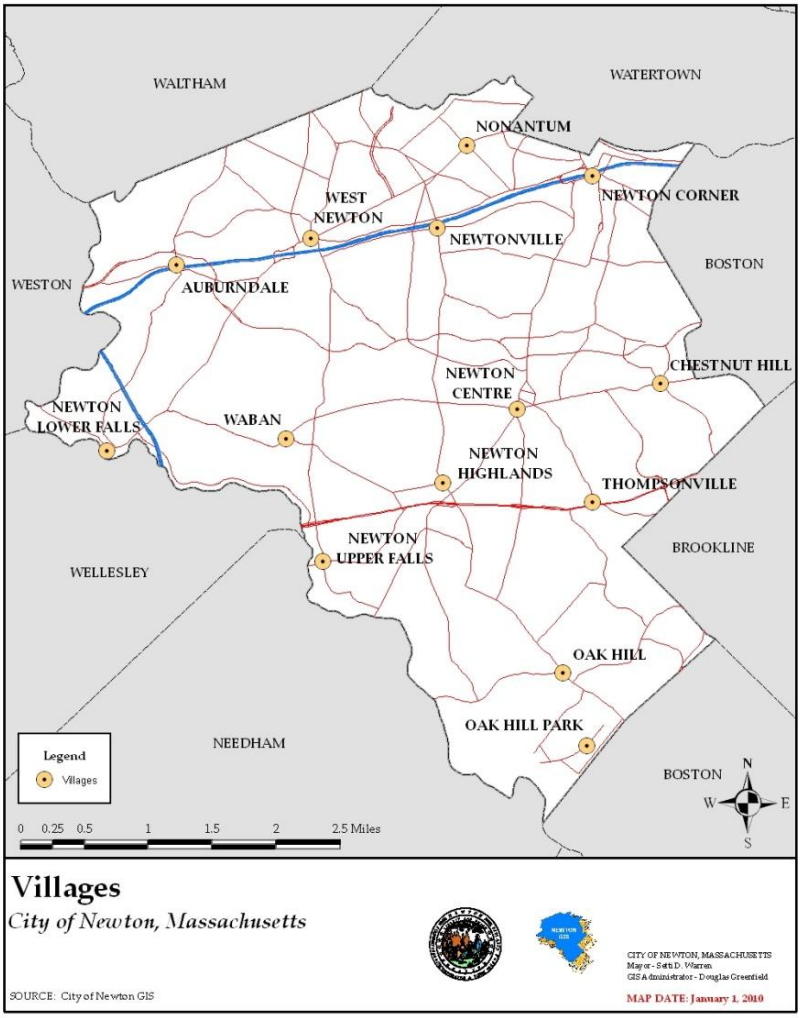

Figure 7: Map of Villages in Newton (City of Newton, 2010)

While in Newton, we conducted our study in four of the villages: Newton Centre, Newton Corner, Chestnut Hill, and West Newton, shown in Figure 3. Each of these areas has its own characteristics that make it unique among Newton's villages. The characteristics of each area affected how we studied pedestrian mobility and ways to improve it in each area.

Newton Centre is a commercial area of Newton that accommodates many transit routes. Newton Centre has a Green Line train stop as well as several bus stops. The village center has two main roads passing through it: Center St and Beacon St. The center is primarily a commercial area with the surrounding areas being residential. There are many small restaurants and shops making this a popular destination for pedestrians. Another main aspect of Newton Centre is a large triangular public parking lot located in the middle of Newton Centre. There are also additional parking lots behind businesses, as well as parking meters along the streets.

Newton Corner is essentially a rotary over the Massachusetts Turnpike (Mass Pike), creating many lanes of heavy traffic coming from the Mass Pike's on- and off-ramps and surrounding neighborhood streets. Heavy traffic exists on many main roads in Newton Corner including Center St, Washington St, and Park St. Along the north side of the rotary are many commercial venues. Additionally, residences are on both sides of the Mass Pike, while an elementary and a middle school exist on the south side.

West Newton also accommodates many transit routes and stations. It has a commuter rail stop and many bus stations. Additionally, it has many main roads such as Washington St, Watertown St, Chestnut St, Waltham St, and Cherry St. The center of the village is both a commercial and civic area. West Newton also has residential areas to the north and south of the Mass Pike. One specific feature of West Newton is its cinema which generates a high number of customers (City of Newton).

The Chestnut Hill area is bisected by a heavy traffic route known as Route 9. In addition, there are main roads including Hammond Pond Park Way and Hammond St. Chestnut Hill is also the location of two malls and a shopping center: the Atrium Mall, the Mall at Chestnut Hill and the Chestnut Hill Shopping Center. Another prominent feature in the area is Hammond Pond on the north side of Route 9 (City of Newton).

3 Methodology

The goal of this project was to provide the city of Newton with recommendations to improve pedestrian mobility in four of its villages. In order to achieve our goal, we developed two main objectives:

- *Assess pedestrian facilities:* To complete this objective, we visually assessed the physical condition of the facilities, observed pedestrian behavior, and interviewed key stakeholders.

- *Develop categorized recommendations for improving pedestrian mobility:* To complete this objective, we analyzed our data, formulated recommendations based on our data, and categorized them based on cost and benefit.

In the following sections, we elaborate on each objective and explain the research methods that correspond to each of them.

3.1 Definition of the Study Areas

We studied four areas in Newton that were identified by Newton's League of Women Voters and the City of Newton's Planning and Developing Department: Newton Centre, Newton Corner, West Newton, and the Chestnut Hill-Route 9 area. We concentrated on specific intersections, crosswalks, school walking routes, and the accessibility of the pedestrian facilities within these locations. We identified these specific locations with our sponsors within each study area.

One reason our study pertains to these areas is because this area is used by children to travel to school and safety for these pedestrians is a necessity. Also, while providing recommendations for improving pedestrian mobility within this area, our sponsors wanted us to concentrate on getting pedestrians with disabilities safely across the Massachusetts Turnpike. Our sponsors saw an opportunity for the Crowne Plaza Hotel to offer accessible travel to all pedestrians. We concentrated our efforts in Newton Corner on these areas:

1. **The intersection of Centre Avenue and Center Street**. This intersection is near the eastern off-ramp for the Massachusetts Turnpike and has large traffic volumes. It is also used by many pedestrians traveling to and from the Southern bus stop as well as to the other side of the Mass Pike.
2. **The intersection of Centre Avenue and Park Street**. This intersection is used to cross the Mass Pike, and also used for school routes to a middle and elementary school. Our sponsors consider Newton Corner unsafe for children, many of whom use this area as a way to walk to school.
3. **The pedestrian walkway through the Crowne Plaza Hotel.** This walkway is located over the Massachusetts Turnpike, and connects the northern side of the rotary to the southern side.

Our sponsors have informed us that Newton Centre is a heavily populated pedestrian area. Improved, safe intersections could encourage more people to walk here, possibly improving the economic growth of the businesses in the center due to the heavier pedestrian traffic flow. We concentrated our efforts in Newton Centre on these areas:

1. **The intersection of Langley Road and Beacon Street.** This intersection needs to be considered for our study because there is an old-age home located on Sumner Street, which stresses the importance of effective pedestrian mobility.
2. **The intersection of Centre Street and Beacon Street.** This intersection exhibits heavy pedestrian and vehicular flow, in order to ensure the safety of people walking within this area it must have effective facilities to keep pedestrians out of harm's ways.
3. **The intersection of Centre Street, Bowen Street, and Gibbs Street.** This intersection is involved with our study because there is a school located on Centre Street and many children use include this intersection during their walk to school. Safety for children is our main priority here.
4. **Two crosswalks located on Centre Street being considered for a new pedestrian beacon, at the intersections with Pelham and Pleasant Streets**. As per request of Newton's Planning and Development Department, we assessed the usefulness of pedestrian beacons and studying two crosswalks within Newton Centre as the new installation of this beacon.

In Chestnut Hill, along Route 9, our sponsors were concerned with getting pedestrians from the T stop and surrounding neighborhoods to the shopping center and Mall areas. Route 9 is perceived by many as impassable for pedestrians, so our focus here was to implement a safe way to cross while increasing mobility on each side safely. We concentrated our efforts in Chestnut Hill on these areas:

1. **The Mall at Chestnut Hill Shopping Center parking lot.** Many pedestrians use the T to get to the shopping areas whether it is for work or shopping.
2. **Crossings across Route 9 from Hammond Street to the Hammond Pond Parkway.** Route 9 can be intimidating to cross; we concentrated on improving the safety of existing crossings or identifying potential new crossings.
3. **Hammond Pond Parkway from where it meets Route 9 to the Mall at Chestnut Hill rear entrance.** We concentrated on improving safety and accessibility by focusing on the facilities there. We identified areas in poor condition as well as areas without beneficial facilities.

In West Newton, in particular, a quarter mile stretch on Washington Street has five traffic signals. We were informed by our sponsors that this area becomes extremely congested by vehicular traffic causing pedestrians to avoid certain areas and pedestrian facilities within this location. With improved facilities and reduced vehicular traffic congestion, our sponsors hoped to encourage full use the facilities in this area so that more people would walk. We concentrated our efforts in West Newton on these areas:

1. **The intersection of Washington Street and Chestnut Street**
2. **The intersection of Washington Street and Cherry Street.**

3. **The intersection of Washington Street and Elm Street**
4. **The intersection of Washington Street and Waltham Street**

We focused on these five intersections in a quarter mile stretch on Washington Street because our sponsors are aware of dangerous rights-on-reds and the heavy traffic congestion caused by the signals at each one.

5. **The accessibility of the Commuter Rail station.** Newton has three commuter rail stations, one of which in West Newton, and our sponsors are aware that none of them have handicapped accessibility. As our project involves increase accessibility for all persons, a requirement for all public facilities from the ADA, we included evaluating this station's facilities in our study.

3.2 Assessment of Pedestrian Facilities

In this section, we discuss our methods for assessing the existing pedestrian facilities in our four study areas. We sought to answer the following research questions in order to accomplish this goal:

- *In what ways are the conditions or operations of existing facilities limiting pedestrian mobility?*
- *Where do gaps in facilities limit pedestrian mobility?*
- *Are there any areas that pose a significant risk to the safety of pedestrians?*
- *Are there opportunities to provide improved mobility between transit stations and destinations of interest?*

We answered these questions through three different means of data collection: visual assessments of pedestrian facilities, observations of pedestrian behavior, and interviews with key stakeholders, allowing for a triangulation of data.

We determined what information we needed through best practices provided by Boston's Metropolitan Planning Organization (MPO) and regulations provided by the Americans with Disabilities Act. The MPO and ADA regulations outline ways of identifying facilities with limiting conditions, gaps in facilities, and those not operating efficiently. Pedestrian facilities such as sidewalks, crosswalks, curb cuts, signage, stop lines and signals have different factors that need to be considered in order to determine if pedestrian facilities meet their specific requirements. These factors are shown in Table 2.

Table 2: Problem Area Factors for Pedestrian Facilities Defined by Boston's MPO

Facility Type	Potential Problem Areas
Sidewalks	Surface conditions Widths

Crosswalks	Visibility Width Necessity of proper medians
Curb Cuts	Widths Number of associated crosswalks
Signage	Improper signage, especially in school zones Missing Signage
Stop Lines	Criteria for multilane roads Distance from crosswalk
Signals	Timing Accessibility

3.2.1: Visual Assessment of Pedestrian Facilities

The first method of data collection we performed was to visually identify the obstacles that significantly impact pedestrian mobility in Newton Centre, Newton Corner, West Newton, and Chestnut Hill. We identified places where pedestrian facilities appear hazardous to pedestrians or facilities limiting access for pedestrians, especially those that are disabled. This information provided our team with evidence regarding what recommendations we could make for improvements on specific facilities.

During this step, our group split into groups of two and walked through each study area and its pedestrian facilities over the course of a week. We studied one area at a time, spending one day for each study area. Each group was responsible for recording challenging areas, which include pedestrian facilities with gaps and those that do not meet the requirements and standards set by best practices, in particular those of the ADA. Gaps consist of areas that are missing facilities such as sidewalks, curb ramps, or crosswalks.

The information gathered from each specific area was entered in on our pedestrian infrastructure identification form, shown in Appendix B, and located on printed maps of the area. This gave us a place to enter data when in the field, give a brief description of the obstacle, and aid in re-locating the obstacle. In addition, photos of all problem areas we recorded were taken to provide a visual aid. These data are independent of traffic patterns, weather, and time of day. Therefore, our group was able to collect this data at any given time during our field work.

3.2.2: Observation of Pedestrian Behavior in Study Areas

Another data collection method we used was to observe pedestrian behavior in each area. Through this step, we identified pedestrian patterns in areas that have a high level of pedestrian traffic and in areas with facilities that are being avoided or ignored. Patterns that showed unsafe or inaccessible facilities were used to determine areas for potential improvements.

In West Newton, we observed how pedestrians used the crosswalks at four intersections. These intersections are located where Washington Street meets Chestnut Street, Waltham Street, Elm Street, and Highland Street. At these locations, we collected observations that answer the following questions:

- *Are pedestrians using the crosswalks located at these intersections safely with enough time given by walking lights?*
- *How and where are vehicles endangering pedestrians with actions such as rights-on-red and U-turns?*
- *Are pedestrians avoiding certain areas due to a lack of accessibility, poor aesthetics, or limited to no pedestrian facilities present?*

Chestnut Hill has a sidewalk along Route 9 that leads up to the Chestnut Hill Mall and the crosswalk leading to the Atrium Mall. Through observing pedestrian behavior in this area, we determined where pedestrians travel here and where pedestrians travel as an alternative to the pedestrian facilities located along Route 9. This area presents another set of questions we wanted to answer:

- *How and where can pedestrians cross Route 9 safely?*
- *Are there any opportunities for safer travel on either side of Route 9 connecting the shopping centers and the T station?*

We studied Newton Corner because our sponsors described travel within Newton Corner, by vehicle or foot, as a daunting task. This area is heavily congested with vehicular traffic from the Massachusetts Turnpike and pedestrian traffic from two major bus stop locations located on the north and south sides, as well as two schools located in the area. In order to observe pedestrians within this area, we developed a data collection plan. We observed how pedestrians cross at Centre Street and Centre Avenue, and at Centre Street and Park Street. Our sponsors described these two areas as posing the most significant challenges for pedestrians. Through answering some research questions in this step, we wanted to find out if it is too intimidating for pedestrians due to the dangerous traffic situations present in that area. These are the questions we have developed for this study area:

- *How do pedestrians cross Newton Corner's intersections? Are the pedestrian facilities being utilized properly?*
- *Do walking lights allow pedestrians to cross here with ample time?*

- *Are there any potentially hazardous situations for pedestrians caused by trends in motorist behavior?*
- *Is there an opportunity to create a handicapped-accessible walkway through Crowne Plaza Hotel?*
- *Where are children having difficulty dealing with vehicular traffic along their school route?*

In Newton Center, we observed pedestrian behavior at three major intersections in the area: Beacon Street and Langley Road, Centre Street and Beacon Street, and Centre Street and Bowen Street. For these intersections our observations were based on and answered through these research questions:

- *How do pedestrians cross these intersections? Do they use the pedestrian facilities properly?*
- *Do cross lights allow pedestrians to cross here with ample time?*
- *How frequently are pedestrians having potentially dangerous encounters with vehicular traffic?*

In each study area, we observed how pedestrians interact with the facilities in that area. We spent a week making observations at each of the locations during the peak commuting times: between 7:30am and 10:30am. These times are similar to those used in MPO study when they did number counts because they tend to be times with the largest amount of pedestrians. During our observations, we split up in groups of two with a set of observation data forms, as shown in Appendix C.

A separate observation we made was determining the usefulness of pedestrian beacons recently installed in Newton. We observed these beacons because the Newton Planning and Development Department expressed an interest in implementing a new beacon in Newton Centre. They are currently deciding whether to implement it at the crossings at Pleasant Street and Pelham Street. Therefore, we did not concentrate on the challenges that these crosswalks present to pedestrians. Instead, we concentrated on which crosswalk would be the best location for a pedestrian beacon.

To determine the usefulness of pedestrian beacons, we went to Langley Road and Langley Path where a beacon is already installed. We also visited a comparable crosswalk at Parker Street and Daniel Street where there is no beacon in place. We compared these two crossings by traveling across both a fixed number of times and determining the percentage of cars that stopped immediately upon our attempt to cross the street. We tested the two crosswalks one person at a time by crossing them 36 times each. We activated the pedestrian beacon when vehicles were approximately 100 feet from the crosswalk, while we entered the crosswalk when vehicles were approximately 100 feet away at the location without the beacon.

Once we evaluated the effectiveness of the beacon, we evaluated the two crosswalks in Newton Centre being considered for the implementation of a new beacon. These two crosswalks are located on a busy street in Newton Centre and are relatively close to each other, so the

placement of the pedestrian beacon is important. To determine which location is best for the new installation of the pedestrian beacon, we will answer this set of research questions:

- *Which crosswalk is safer for pedestrians to cross?*
- *Which crosswalk is used the most?*

We determined which crosswalk is used more by pedestrians, and which is safer by making observations at these two intersections during lunch time. We chose to observe pedestrians at this time, rather than at the morning, because Newton Centre is a popular lunch destination and has the heaviest pedestrian traffic during this time. We conducted number counts at each crosswalk to determine which is the most used, as well as observations of pedestrians interacting with vehicles, to determine if the interactions are safer at one over the other.

3.2.3 Interviews with Key Stakeholders

Along with our investigation of the areas of concern, we also interviewed various individuals and organizations who have a vested interest in pedestrian mobility and the community of Newton. We sought their views on what challenges and where they exist within the study areas, and how they thought pedestrian mobility could be improved. This helped us gather insight from organizations and experts as to some techniques that can be implemented to improve mobility, or have been proven in the past through other pedestrian related studies. We also obtained information from these groups about problems that we were not able to see first-hand while in Newton

We contacted representatives of the key stakeholders and scheduled face-to-face interviews with the Aldermen Committee, Boston's Metropolitan Planning Organization, residents of Newton through neighborhood associations, and other groups that provided helpful information. The opinions of Boston's Metropolitan Planning Organization's on improvements towards pedestrian mobility were particularly helpful because they had previously conducted a similar pedestrian mobility study in six urban centers across Massachusetts. The representative from this group that we interviewed was Cathy Buckley. During our interview with Ms. Buckley, we walked through Newton Centre with her and discussed possible improvements regarding pedestrian mobility in this area. Her input has been taken as an expert's opinion and any specific improvements she recommended have been taken into consideration. We also applied the principles learned here to the other study areas.

The interviews were semi-structured, with a set of general questions that do not need to be answered in a specific order. We prepared questions that covered a set of general topics relevant to each group. These questions were based on our research questions and focused on the study areas relevant to the interviewee. The questions considered key topics including facility condition, and dangerous or inaccessible areas. The interview protocol is shown in Appendix E.

3.3 Development of Recommendations

The focus of this step was to determine patterns, agreements, and consistencies between our three types of assessment data collected during our visual assessments, pedestrian observations, and stakeholder interviews. We used these patterns in order to find what areas need

the most improvement. To accomplish this objective, we answered the following research questions:

- *What consistencies can be seen between the three sets of data collected?*
- *What improvements to pedestrian facilities do these agreements suggest?*
- *How should these improvements be categorized?*

We developed a process to answer each of these questions. Through these steps, we will reach our goal of recommending improvements for each study area.

3.3.1 Analysis of Assessment Data

First, we analyzed the information gathered through the three steps in our methods. We identified evidence in areas showing a need for improvement or the possibility for improvement. This evidence was shown in various charts (see Appendices B, C, and D). In each chart, we identified each specific location of interest and will show the problems areas discovered. By having each set of data collection side by side we can identify areas of agreement between them. These similarities, along with the data individually, allowed us to identify improvements for pedestrians in each area.

Other significant challenges or opportunities to pedestrian mobility found through the first three objectives individually were also considered when recommending improvements. The data from an obstacle that is not supported in all three data collecting objectives could still be significant to the improvement of effective pedestrian mobility in a problem area. This could be a challenge or opportunity noticed in two of our data gathering methods, but not be reinforced by the other. For example, a pedestrian facility could exhibit such poor conditions that, despite a lack of support from other data, an improvement would still be advisable.

3.3.2 Formulate Recommendations

After analyzing our three sets of data and determining opportunities for improved pedestrian mobility, we began formulating recommendations. Our recommendations were guided by similar case studies done in other areas. Boston's Metropolitan Planning Organization has conducted many studies in areas around Newton with similar properties. Brookline, in particular, is a community identified by MPO representative Cathy Buckley as similar to Newton. Through these reports, we identified solutions that are applicable to the areas targeted for improvement.

Recommendations will also be taken from experts and other interviewees with knowledgeable opinions, who can provide valuable insight on what can be done through their extensive experience within each location. We compared recommendations suggested by our interviewees and those shown in MPO, San Diego's Regional Planning Agency, and ADA regulations. Then we developed recommendations that are most applicable to each area.

3.3.3 Classify Recommendations

Once we identified recommendations for each location within our study areas, we wanted to classify them based on costs and benefits. This will help the City of Newton identify priorities and allocate resources. This was done using the following guidelines:

- **Low Cost:** This consists of recommendations under $10,000.
- **High Cost:** This consists of recommendations over $10,000. These also include recommendations that require a large amount of future planning from experts to implement change.
- **Low Impact:** This consists of recommendations that improve pedestrian mobility slightly, in a semi-permanent way, or pertain to areas with few safety and accessibility concerns.
- **High Impact:** This consists of recommendations that greatly improve safety or accessibility, permanently, or are in areas with many challenges to pedestrian mobility.

After we generated a list of recommendations, we classified them into short-term and long-term recommendations. Short-term recommendations are those that require little planning or design and can be implemented quickly with low costs. Long-term recommendations are those that require extensive planning and funding before being implemented. We then imported this data onto separate aerial maps for each area by category that are similar to the ones provided by Boston's MPO study on six urban areas. Each recommendation has been numbered with a brief description using a text box.

4 Findings

In this chapter, we present our assessment of pedestrian mobility in four study areas within Newton. For each, we identify problems that emerged from our visual assessments, observations of pedestrian behavior, and interviews with key stakeholders. We then present our recommendations for improvement in each area of focus.

4.1 West Newton

In this study area, we have discovered many areas that present problems to pedestrians, as well as areas that present opportunities for better pedestrian mobility. Dangerous interactions between congested vehicle traffic and pedestrians are common throughout West Newton. Additionally, many pedestrians choose their own crossings rather than using the designated crosswalks and walking lights. Other opportunities West Newton presents are improved accessibility to the commuter rail station, implementation of better bus shelters and bike racks, and the implementation of new crosswalks that could inform drivers where pedestrians are likely to cross. These problems and opportunities occur throughout this area including at each intersection of interest.

We focused on four streets that intersect with Washington Street. In this section, we discuss the areas for improvement as well as potential solutions. Below is a map detailing where areas for improvement exist in West Newton.

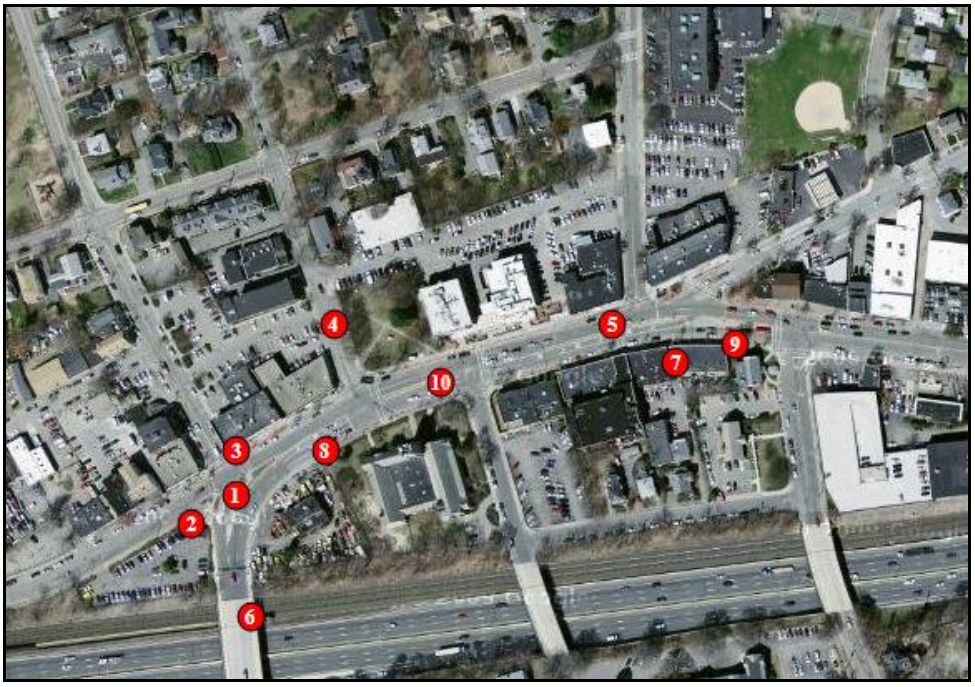

Figure 8: West Newton Problems and Opportunities Map

At the intersection of Elm Street and Washington Street:

1. **Confusing Crosswalk Design:** The crosswalks at this intersection do not represent the paths pedestrians normally take and are not in the safest place for crossing through this area, as shown in Figure 9.

   Recommendation: Implement a new crosswalk. We recommend implementing a new crosswalk across from Elm Street at the north side of the intersection with Washington Street. This was a common path along one lane of traffic and would provide a safe place to cross.

Figure 9: Potential New Crosswalk Location

2. **Walking Light Not Visible:** As shown in Figure 10, the walking light is turned away from the crosswalk, making it impossible for a pedestrian to determine when the light indicates it is safe to cross.

Figure 10: Walking Light Not Visible

Recommendation: Rotate the walking light. We recommend rotating the walking light back to facing the crosswalk to encourage pedestrians to use this facility.

3. **Broken Walking Button:** The button on the eastern corner of Washington Street and Elm Street near Boston Sports Club does not change the walking light.

   Recommendation: Fix the walking light. We recommend fixing this mechanism to encourage pedestrians to use this facility.

<u>At the intersection of Cherry Street and Washington Street:</u>

4. **Opportunity for a New Crosswalk:** Part of Cherry Street connects a parking lot to a small pedestrian park. During our morning observations, we noticed more people crossing at this part of Cherry Street than at the intersection itself.

   Recommendation: Implement a crosswalk. We recommend implementing a crosswalk between these two locations to inform vehicles that pedestrians are likely to cross here, creating a safer environment for both pedestrians and vehicles.

At the intersection of Waltham Street and Washington Street:

5. **Poor Location of Crosswalk:** The crosswalk across Washington Street at this intersection is poorly located. Its current location possesses dangers from rights-on-red and also presents a long crosswalk that possesses heavy traffic congestion, causing vehicles to backup onto it.

   Recommendation: Move the crosswalk. Moving the crosswalk across Washington Street to the other side of Waltham Street will allow pedestrians to cross through a median already implemented, reducing the time spent where pedestrians are interacting with vehicles. This will also remove the dangers of vehicles taking rights-on-red onto Washington Street because rights-on-red are already prohibited on Watertown Street.

Outside these four intersections:

6. **Inaccessible Commuter Rail Platform:** There are three commuter rail stops in Newton, none of which are handicap-accessible.Figure 11 shows the West Newton platform, which only has stairs leading down to it. Since the ADA requires that all public facilities be accessible to all persons, this portrays Newton in a bad light. Therefore, it is important to address this issue.

   Recommendation: Construct a ramp to the Commuter Rail platform. We recommend that implementing a ramp at the stop in West Newton will make Newton more accommodating to all persons. This ramp needs further planning and MBTA involvement and funding.

Figure 11: Inaccessible Commuter Rail Station

7. **Hidden Pedestrian Pathway:** Currently, most pedestrians access the shops along Spencer Street by traveling down Chestnut Street to Spencer Street. However, there is a public alleyway connecting these two areas from Washington Street to Spencer Street directly.

   Recommendation: Make alleyway more appealing to pedestrians. We recommend making this alleyway more aesthetically pleasing and noticeable will encourage its use, shortening the path pedestrians take and at the same time further removing them from the roadways, thereby increasing safety.

8. **Sidewalks in Poor Condition:** The sidewalks in West Newton are generally in good condition; however, some areas feature cracked and broken sidewalks, as shown in Figure 12, creating tripping hazards that are particularly dangerous to the elderly and the disabled. At the same time, many sidewalks are lined with brick buffers and brick curb cuts.

Figure 12: Cracked Sidewalk (left); Poorly maintained brick (right)

   Recommendation: Repair or replace sidewalks. We recommend repairing or replacing these sidewalks, which will provide more even surfaces for pedestrian travel. We also recommend repairing brick surfaces over time as the brick degrades with a cheaper material known as pressed concrete. This will provide a more even surface while at the same time provide a similar aesthetic appeal. The ADA advises against any uneven surface including brick and suggests replacements and repairs to challenges such as these.

9. **Lack of a Proper Bus Stop:** This bus stop lacked a full shelter and bike racks, making this facility less appealing, as displayed in Figure 13.

   Recommendation: Implement full bus shelters. We recommend making bus stops more appealing to pedestrians and bicyclists through implementing full bus shelters and bike racks throughout Newton.

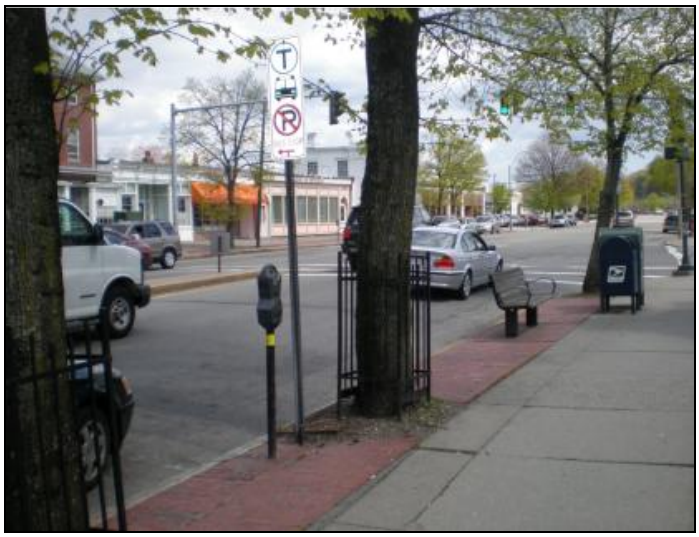

Figure 13: Bus Stop

10. **Traffic Congestion:** Due to five signals on a quarter mile stretch of Washington Street, there is heavy traffic congestion in this area, causing motorists to stop in crosswalks deterring many pedestrians from using this facility. This forces pedestrians to walk around vehicles presenting dangerous situations because drivers have reduced visibility of pedestrians in between or behind vehicles.

    Recommendation: Retime the traffic signals. We recommend retiming the traffic signals along Washington Street to allow better traffic flow. This will reduce stopped vehicles on crosswalks increasing pedestrian safety.

Summary of West Newton Recommendations

Figure 14: West Newton Recommendations Map

Location on Fig. X	Recommendation	Cost	Impact
1	Implement a new crosswalk	Low	Low
2	Rotate the walking light	Low	Low
3	Fix the walking light	Low	Low
4	Implement a crosswalk	Low	Low
5	Move the crosswalk to east side of Waltham Street	Low	High
6	Construct a ramp to Commuter Rail platform	High	High
7	Make the alleyway more appealing to pedestrians	Low	High
8	Repair sidewalks	Low	Low

Location on Fig. X	Recommendation	Cost	Impact
	Replace sidewalks	High	Low
9	Implement full bus shelters	High	High
10	Retime traffic signals	High	High

4.2 Newton Corner

In this study area, we noticed many problematic patterns that involved inaccessibility and unsafe facilities. This included poor surface conditions, and an inaccessible path through the Crowne Plaza Hotel. Also, curb cuts and signals were not always designed to the accessibility standards provided by the ADA. In this section, we discuss the areas for improvement found in Newton Corner as well as potential solutions for these problems, as shown in Figure 15.

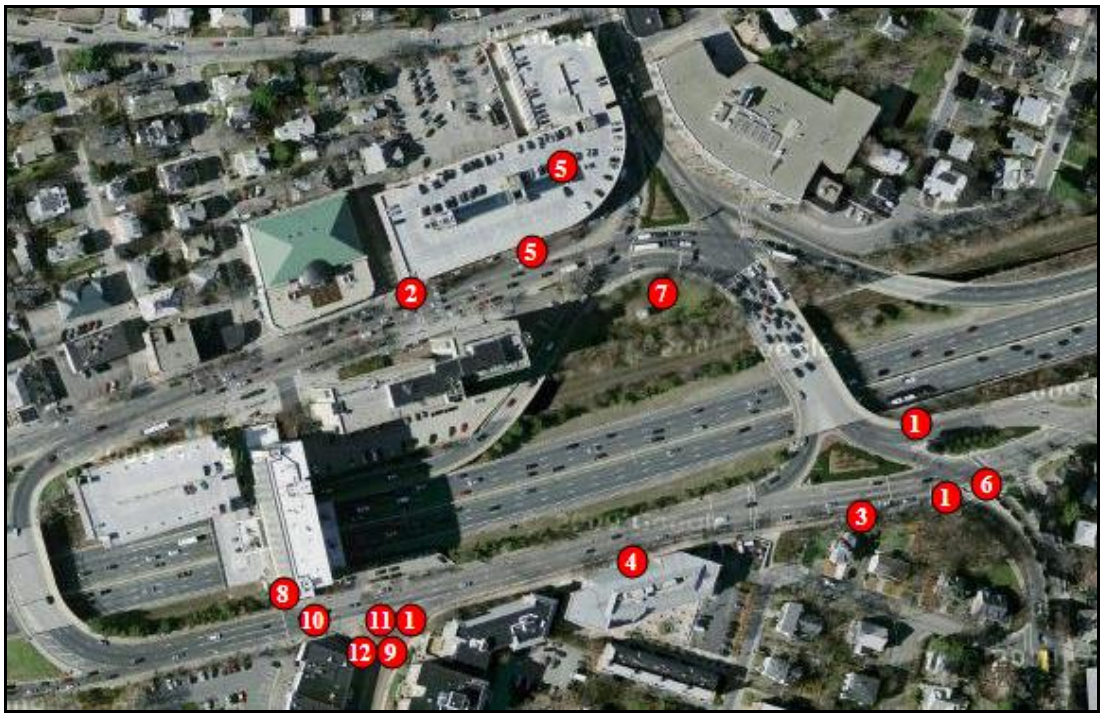

Figure 15: Newton Corner Problems and Opportunities Map

1. **Dangerous Conditions caused by Right Turns on Red:** One challenge we found during our observations were dangerous conditions caused by right turns during red lights. This problem was observed at the intersection of Centre Street and the intersection of Centre Avenue and Park Street and Centre Avenue. Both intersections have large volumes of vehicles and this causes frequent right turns on red. These frequent turns, in addition to aggressive driving, can cause hazardous situations.

   Recommendation: Prohibit rights-on-red. We recommend this for the Park Street and Centre Avenue intersection, specifically the right turn on to the bridge over the Mass Pike. High traffic volumes and aggressive driving cause dangerous and inaccessible travel for pedestrians crossing this street.

   Recommendation: Install a "No Turn on Red" signal. We recommend implementing a signal that prohibits rights on red during the walking light at the right turns at Centre Avenue and Centre Street as well as the right turn from Centre Avenue onto Park Street.

This will decrease potential conflicts between pedestrians crossing during the walk phase and vehicles turning right.

2. **Hazardous Brick Surfaces:** Washington Street, for example, has a partial brick surface, as shown in Figure 16. Brick surfaces are extremely difficult to maintain and can be hazardous. The ADA suggests uneven surfaces such as bricks should be avoided.

Figure 16: Brick Surface along Washington Street

Recommendation: Replace with pressed concrete. We recommend replacing the brick surfaces with pressed concrete. Pressed concrete maintains some of the aesthetic appeal of brick while providing a safer traveling surface. This can be implemented systematically over time. As the brick degrades, pressed concrete could be used as a replacement. An example of pressed concrete is shown below in Figure 17.

Figure 17: Pressed concrete on Washington Street in Newton Corner

3. **Debris on Sidewalks:** Also, sidewalks in this area, especially along Centre Ave, are covered with debris such as sand and dirt. The debris can make the sidewalk slippery and therefore hazardous.

   Recommendation: Clean sidewalks seasonally. Even though this is a seasonal issue for the spring and most likely will be addressed, we recommend cleaning sidewalks more frequently and sooner after the winter season. This will minimize the time that sidewalks are hazardous. This will require the cooperation of the Department of Public Works which is responsible for maintaining these facilities.

4. **Lack of Proper Bus Stop:** At the south side stop, we found that the bus shelter was open and unattractive. This current shelter does not protect the bus users from the elements, as displayed in Figure 18. Another challenge at this bus stop was a lack of bicycle racks. There currently are no outside bike racks in the vicinity of the bus stop.

Figure 18: Newton Corner south bus stop

   Recommendation: Implement full bus shelter and bike racks. We recommend implementing a full bus shelter at this stop. We were informed by our sponsors that this is the second-most used stop in Newton. Therefore, it is beneficial to shelter the bus patrons from the weather here. We also recommend implementing bike racks at this stop.

5. **Lack of Proper Bike Racks:** Specifically at the north side stop, an additional problem could be the lack of knowledge of existing bike racks. We noticed that a person had locked their bike to a trash can at this stop, shown in Figure 19. Here we found that there are bike racks in a nearby public parking garage that could be used by bus patrons. Another challenge at this bus stop was a lack of bicycle racks. There currently are no outside bike racks in the vicinity of the bus stop.

Figure 19: Newton Corner north bus stop

Recommendation: Install bike rack. We recommend implementing bike racks at this stop. This will allow patrons to have a designated place for their bikes and will help promote this mode of transportation in the area.

Recommendation: Implement informative signage. We recommend placing signs at this bus stop that will inform bicyclists of the location of the current bike racks and encourage bicyclists to use them.

6. **Inaccessible Walking Button:** A walking light at Park St and Centre Ave also presents a challenge. Here, we found that the walking button is in the center of a raised median thus making it inaccessible to the disabled and elderly, seen in Figure 20. Also, this walking button was not functional. This walking button presents a safety concern as well as violating the ADA regulations on its accessibility. Below are two options for improving the accessibility of the walking light.

Figure 20: Inaccessible Walking button at Centre Avenue and Park Street

Recommendation: Create curb cuts on and off the median. After fixing the walking signal itself, we recommend implementing curb cuts to allow access to the walking button. This will also elevate pedestrians from the level of traffic thus increasing the perception of safety.

Recommendation: Relocate the walking button. After fixing the walking signal itself, we recommend relocating the walking button to the edge of the median. This will make the button accessible from the median cut through.

7. **Closed Green Space:** In Newton Corner, there are not many green open spaces. Therefore, an area for improvement could be the Memorial Bell Park that is currently completely enclosed by a fence, as evident in Figure 21. This area has the potential to be a public area that would attract pedestrians and also offer them a safer path to travel.

Figure 21: Bell Park on the north side of Newton Circle Rotary

Recommendation: Open the park. We recommend opening this park to the public. This could be opened from dawn until dusk in order to prevent problems with misuse, such as vandalism. This will allow residents and employees to enjoy a green space.

8. **Inaccessible Walking Path:** An inaccessible path through the Crowne Plaza hotel was identified as a challenge. This cut through passes over the Massachusetts Turnpike connecting the north and south sides of the village center, shown in Figure 22. However, on the south side, there is a stairway preventing all disabled persons and many elderly from utilizing this path. Without the ability to use this path, pedestrians must walk around the west side of the rotary, which is a long, indirect path for many. During a walkthrough of the area, we noticed an elderly man using a cane traveling around this corner.

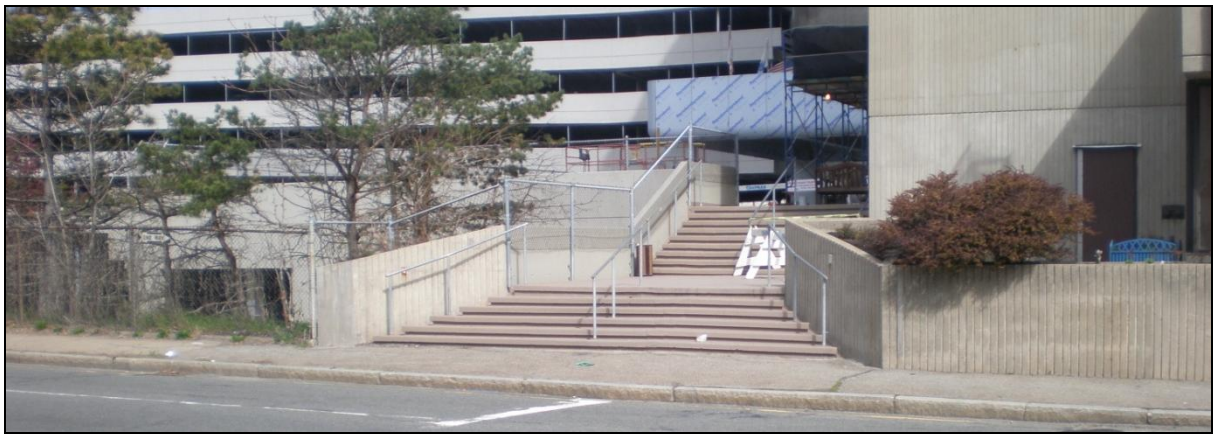

Figure 22: Crowne Plaza path - south side

Recommendation: Implement a ramp. We recommend the implementation of a pedestrian ramp on the south side of the path to allow access to all persons in accordance with ADA regulations.

9. **Improper Placement of Traffic Signals:** The traffic signals for the right turn on Centre Street at the intersection of Centre Avenue are located after the crosswalk, as shown in Figure 23. This causes cars stopped at the light to block the crosswalk and cause a hazard for pedestrians.

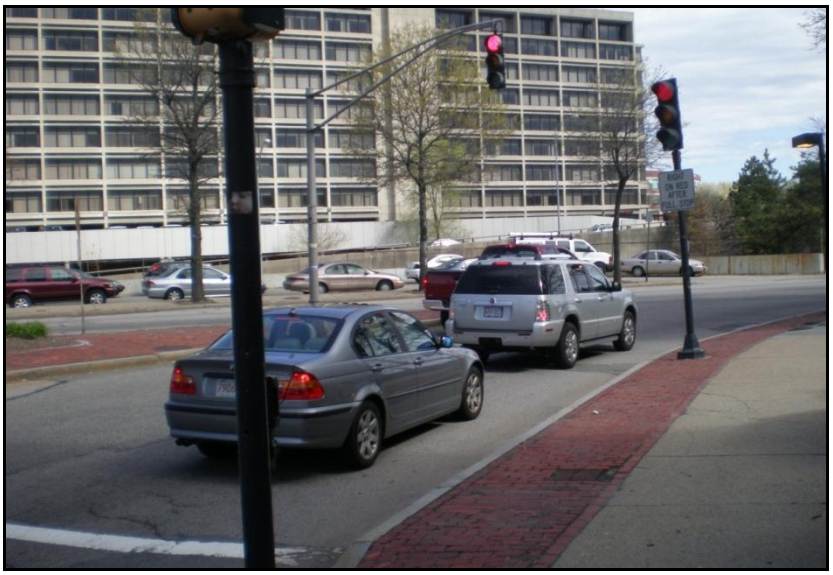

Figure 23: Traffic signals at Centre Street and Centre Avenue

Recommendation: Change traffic signals. We recommend moving the light on the median past the crosswalk to the same location as the other traffic light on the median. Also, we recommend removing the traffic signal on the right hand side of the road altogether.

10. **Walking Signal Sequencing:** The two walking signals for crossing Centre Street at the intersection with Centre Avenue are not properly timed or sequenced. This may cause pedestrians to be trapped on the median for an entire signal cycle.

    Recommendation: Sequence the walking signals. We recommend sequencing the walking signals. This will allow pedestrians to cross the entire street at one time rather than in two separate cycles.

11. **Uneven Median:** The median on Centre Street at the intersection with Centre Avenue is not a level surface and may cause some difficulties for disabled pedestrians, as shown in Figure 24.

Figure 24: Median at Centre Street and Centre Avenue

*Recommendation: Level the surface***.** We recommend leveling this surface in order to allow safer travel to all pedestrians.

12. **Pedestrian Sight Line:** The crosswalk on the left side of Centre Street at the intersection of Centre Avenue causes pedestrians traveling from the median to face away from traffic. Again, this causes a safety concern because the pedestrian may not see on-coming vehicles in the road.

    *Recommendation: Change the crosswalk angle***.** We recommend making this crosswalk parallel with Centre Avenue in order to allow pedestrians the ability to see on-coming vehicles. Cathy Buckley, a MPO representative, informed us of this challenge.

Summary of Newton Corner Recommendations

Figure 25: Newton Corner Recommendations Map

Location on Fig. X	Recommendation	Cost	Impact
1	Prohibit right turns on red	Low	High
	Install a "No Turn on Red" signal	Low	High
2	Replace with pressed concrete	Low	Low
3	Clean sidewalks seasonally	Low	Low
4	Implement a full bus shelter and bike racks	High	High
5	Implement bike racks or install informative signage	Low	Low
6	Create curb cuts on and off median	Low	High
	Relocate the walking button	Low	High
7	Open Bell Park	Low	Low
8	Implement a ramp	High	High

Location on Fig. X	Recommendation	Cost	Impact
9	Change traffic signals	High	High
10	Sequence the walking signals	Low	Low
11	Level the surface	Low	Low
12	Change the crosswalk angle	Low	Low

4.3 Newton Centre

Newton Centre, one of Newton's foremost pedestrian areas, presents many challenges present many challenges that impact pedestrian traffic due to the number of shops, cafes, restaurants, and small businesses in the village. We studied the following intersections: Langley Road and Beacon Street, Beacon Street and Centre Street, and Centre Street and Bowen Street. Below, we discuss the challenges that we found and our recommendations for these intersections. A map outlining these challenges is shown in Figure 26.

Figure 26: Newton Centre Problems and Opportunities Map

<u>At the intersection of Langley Road and Beacon Street:</u>

1. **Inaccessible Walking Light Button Located on Median:** The median located where Langley Road begins to intersect with Beacon Street and Sumner Street currently has a cut-through so that pedestrians do not need to step on the median, while still separating them from vehicular traffic. Located on this median is a walking light, as shown in Figure 27. The challenge that pedestrians face here is there are no curb cuts allowing access to the walking light; this prevents people from crossing this street safely. Our

recommendations shown below for this challenge are two options that could be implemented:

Figure 27: Walking light located on top of an inaccessible median at the intersection of Langley Road and Beacon Street

Recommendation: Install a curb cut. We recommend installing a curb cut onto the median to allow access for everyone to use the walking light.

Recommendation: Relocate the walking light. We recommend relocating the walking light to the edge of the median so it is accessible to pedestrians traveling through the pre-existing cut-through.

2. **Steep Slope of Curb Cut and Long Crosswalk:** When traveling east through this intersection, where Langley Road and Beacon Street begin to separate, there is a curb cut that has a sharp slope, shown in Figure 28. This impedes those with walking disabilities from accessing the sidewalks located on the respective streets, forcing many people to walk in the street instead of utilizing the crosswalk. At this intersection, we observed many people avoiding this curb cut. This is extremely unsafe as it is forcing pedestrians to interact with vehicles. Also located at the steep curb cut is a long crosswalk crossing Beacon Street on the east side. Long crosswalks present the challenge of crossing the street in enough time to avoid vehicular traffic.

Figure 28: Steep curb cut located at the intersection of Langley Road and Beacon Street

Recommendation: Implement a sidewalk extension into Beacon Street. We recommend implementing a sidewalk extension, known as a "*bulb-out*", which would create a shorter distance for pedestrians to travel along the long crosswalk. Also, by creating a larger pedestrian facility, there may be enough room to design a more accessible curb cut in order for people to use the sidewalks in the area.

<u>At the intersection of Beacon Street and Centre Street:</u>

3. **Dangerous Conditions caused by Right-on-Red:** One of the major challenges that pedestrians face in this intersection is competition with vehicles heading northbound on Centre Street attempting to take a right turn onto Beacon Street while having a red traffic signal, seen in Figure 29. We observed pedestrians attempting to cross with the walking signal however they were stopped by vehicles taking right-on-reds. The following recommendations represent alternatives for improvement.

   Recommendation: Eliminate the right-on-red. We recommend eliminating right-on-reds. This will eliminate completion between pedestrians and vehicles and thus create a safer crossing for pedestrians.

   Recommendation: Redesign the corner. Another option would be creating a sharper corner where vehicles take a right-on-red. The corner should be well squared forcing motorists to slow down when taking the right turn, increasing the safety of pedestrians crossing.

   Recommendation: Install a "No Turn on Red" traffic signal. A third option is to install a signal saying "No Turn on Red" that will only be activated when pedestrian use the walking light. This will allow a safe way for pedestrians to cross the street and eliminates all competition between pedestrians and vehicles.

Recommendation: Install "leading interval" traffic lights: Finally, we recommend the installation of *leading interval traffic lights* that are synchronized with the walking light. Once the walking signal is activated, the traffic signals will be red long enough to provide enough time for a pedestrian to travel half way across the street before letting vehicular traffic start again. This provides a safe way to cross the street and also prevents vehicular traffic congestion by allowing traffic to continue when the pedestrian is using the second half of the crosswalk.

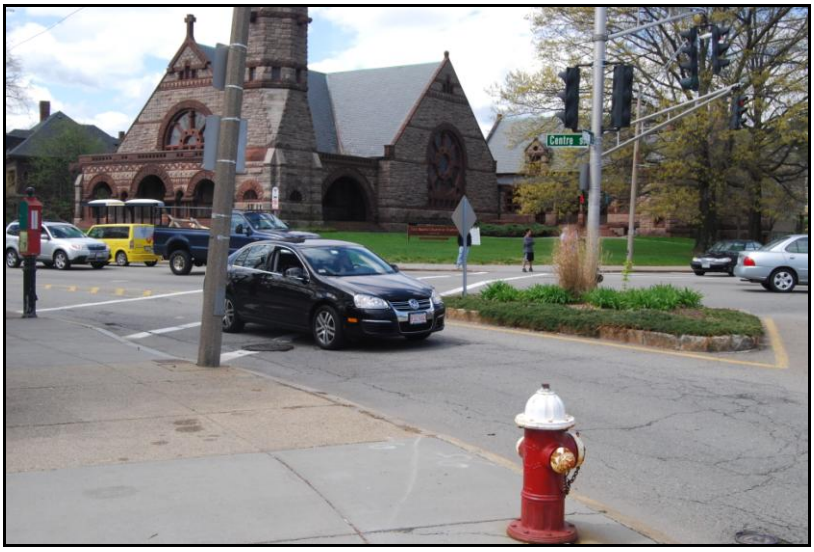

Figure 29: Car making a Right-on-Red at Centre Street and Beacon Street

<u>At the intersection of Centre Street and Bowen Street:</u>

4. **Traffic Congestion on Crosswalk:** Centre Street experiences heavy northbound vehicular congestion during peak commuting times. At this particular intersection, cars stop on the crosswalk due to the heavy congestion. This presents challenges to pedestrians trying to cross using this crosswalk because it causes them to walk around the vehicle, increasing the interaction time with motorists and also affecting the visibility of pedestrians for those motorists traveling south on Centre Street.

   Recommendation: Install signage. We recommend the installation of signage in the area notifying motorists to avoid stopping on pedestrian facilities. This can be done with traditional signs or patterns painted on the road to make motorists more aware of pedestrian zones in this area.

5. **Appeal and Access to Newton Centre Playground:** Located at the corner of Centre Street and Bowen Street is Newton Centre Playground. This playground has no benches or bike racks and could be made more appealing to those walking in the area. There is also a bus stop located at this corner which is not used frequently.

Recommendation: Install a bus shelter, bike racks, and benches. We recommend installing a bus shelter, bike racks, and benches in the playground area and around the bus stop. These aesthetic improvements are intended to encourage people to walk within this area.

Pedestrian Beacon:

When conducting our study on improving pedestrian mobility in Newton Centre, we were also asked to determine if the installation of a new pedestrian beacon on Centre Street would be useful and if so, to determine which crosswalk would be most suitable for this beacon. We conducted a test of the effectiveness of an existing beacon at Langley Road and Langley Path by comparing safety at that crossing to that at Parker Street and Daniel Street, a similar location without a beacon, both shown in Figure 31. We found that at the crosswalk with the pedestrian beacon, 53% of cars stopped for pedestrians who had activated the beacon and stepped into the crosswalk. At the crosswalk with no beacon, only 12.5% of cars stopped for a pedestrian in the crosswalk under similar circumstances. We concluded that the beacon is useful for notifying motorists that a pedestrian is trying to use the crosswalk, prompting the motorists to yield for those attempting to cross.

During our observations of the candidate crosswalks in Newton Centre, we observed three times as many pedestrians crossing at Pleasant Street rather than Pelham Street. We also noted the crosswalk at Pelham Street provides a shorter travel distance. The crosswalk at Pleasant Street is at the top of a hill and pedestrians crossing may not be seen by motorists at the appropriate stopping sight distance.

Recommendation: Implement a beacon at Pleasant Street. We recommend implementing a new pedestrian beacon at Pleasant Street. Implementing a beacon here would increase safety by increasing the awareness of pedestrians for motorists driving up the hill. It would also be beneficial to a large amount of pedestrians in this area.

Figure 30: Pedestrian Beacon at Langley Road and Langley Path (left); Crossing at Parker Street and Daniel Street without a Beacon (right)

Summary of Newton Centre Recommendations

Figure 31: Newton Centre Recommendations Map

Location on Fig. X	Recommendation	Cost	Impact
1	Install curb cut	Low	High
	Relocate the walking light	Low	High
2	Implement a sidewalk extension into Beacon Street	High	High
3	Eliminate the right-on-red	Low	High
	Redesign the corner	High	High
	Install a “No Turn on Red” traffic signal	Low	High

Location on Fig. X	Recommendation	Cost	Impact
	Install “Leading Interval” traffic lights	High	High
4	Install signage	Low	Low
5	Install a bus shelter, bike racks, and benches	High	High
6	Install a pedestrian beacon at Pleasant Street	Low	High

4.4 Chestnut Hill - Route 9

The Chestnut Hill area along Route 9 was designed with vehicles and parking in mind, and pedestrian mobility suffers as a consequence. This study area is dominated by heavy traffic vehicular routes such as Route 9 and Hammond Pond Parkway. Due to the high traffic volumes present throughout the day on Route 9, it is perceived by pedestrians as unsafe, despite having fairly new pedestrian facilities in place. We focused on three areas of concern: the travel path of pedestrians through the Mall at Chestnut Hill Shopping Center, the crossings on Route 9 until it reaches Hammond Pond Parkway, and Hammond Pond Parkway itself.

In Figure 33, we highlight challenges pedestrians face in this study area; each problem is signified by a red circle with a number corresponding to the following text.

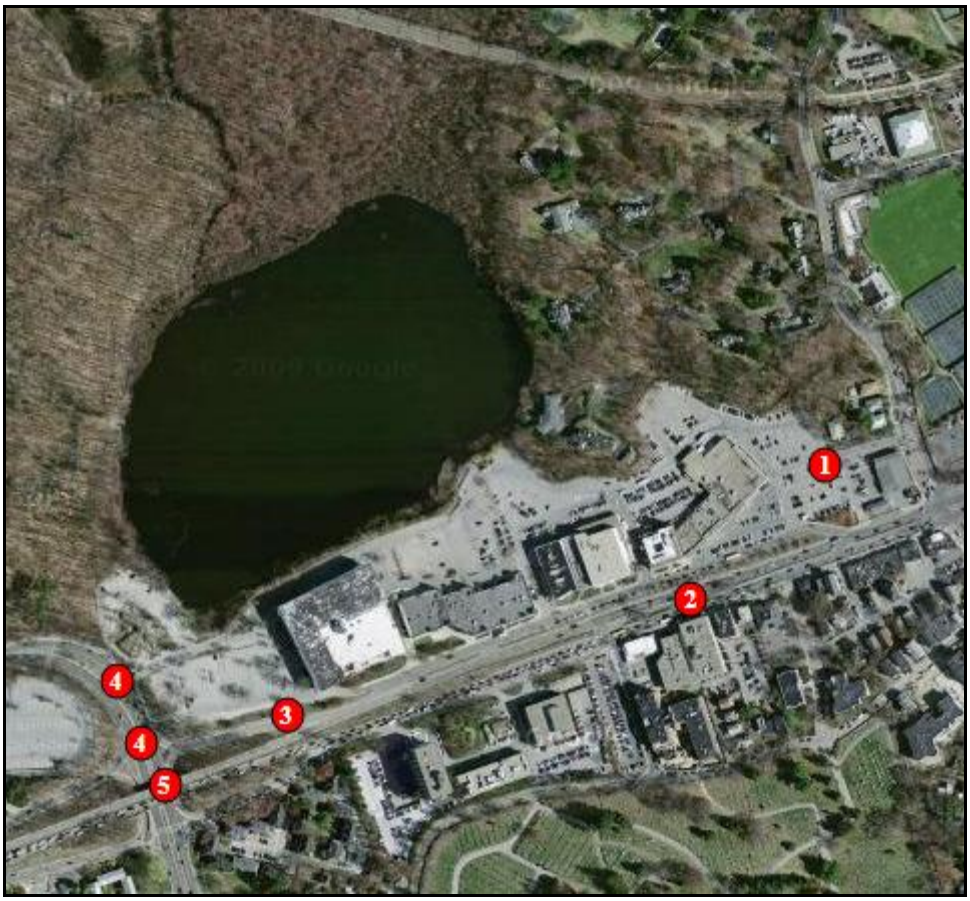

Figure 32: Chestnut Hill Problems and Opportunities Map

From the Chestnut Hill T stop through the Mall at Chestnut Hill Shopping Center:

1. **Dangerous Interactions in Parking Lot:** The first problem we observed were pedestrians cutting through a parking lot entrance to the Chestnut Hill Shopping Center. The cut through begins behind a CVS Pharmacy on Hammond St. with a designated pedestrians area marked by white stripes. This can be seen below in Figure 34. However, where the parking lot begins the designated pedestrian path ends, leaving pedestrians to choose their own paths and causing potentially dangerous interactions between motorists and vehicles.

   Recommendation: Install crosswalks. We recommend that the crosswalks throughout the Chestnut Hill Shopping Center, shown in Figure 34, extend to the pedestrian designated entrance by CVS. This would be beneficial to pedestrian safety. Having pedestrians follow a designated path allows vehicles to be more aware of where pedestrians are likely to travel.

Figure 33: Back entrance to the Mall at Chestnut Hill Shopping Center (left); Crosswalks in Shopping Center Parking lot (right)

Along Route 9:

2. **Unsafe Designated Crossing:** There is a crosswalk across Route 9 located on the Brookline portion between Finagle-A-Bagel and the Chestnut Hill Shopping Center. This crosswalk is not safe for pedestrians to use because it is not signalized, and heavy vehicle traffic is almost always present at high speeds. Due to this, pedestrians cannot accurately determine on their own accord when a safe time would be to cross. This crossing is very intimidating and dangerous resulting in a lack of use. This crosswalk is shown in Figure 35. Below are two alternatives for improving safety at the crosswalk.

   Recommendation: Remove the crosswalk. We recommend removing the crosswalk and encouraging people to use the two other crosswalks along Route 9, one at Hammond St. the other at Tulley St.

Recommendation: Implement a walking light. Alternatively, we recommend implementing a walking light, stopping traffic on both sides of Route 9, and allowing pedestrians to cross safely.

Figure 34: Un-signalized Crossing on Route 9

<u>Along Hammond Pond Parkway:</u>

3. **Inaccessible Sidewalk:** The sidewalk leading from Route 9 onto Hammond Pond Parkway on the westbound side is inaccessible, presents dangerous conditions for the elderly and disabled, and is not aesthetically pleasing. Where the off-ramp extends towards Hammond Pond Parkway, a sidewalk also begins. However, there are no crosswalks leading to this crosswalk and no curb cuts allowing those in wheel chairs access to this. Even when a pedestrian reaches this sidewalk, it is broken and covered in debris, which can present many tripping hazards to the elderly and disabled. The sidewalk looks as though it is not meant to be used. The beginning of this sidewalk is shown in Figure 36.

Figure 35: Poorly maintained sidewalk along Route 9 leading to Hammond Pond Parkway

Recommendation: Replace existing facilities. We recommend that this sidewalk is replaced and new facilities such as curb cuts and crosswalks are installed with its replacement.

4. **Hazardous Facilities along Hammond Pond Parkway:** The conditions of the sidewalk and facilities associated with it continue to be a problem along Hammond Pond Parkway.

    a. **Hazardous Pedestrian Crossing without Proper Facilities:** Cars traveling southbound on Hammond Pond Parkway approach the intersection of Route 9 right after they take a sharp turn down a steep hill. Pedestrians do cross here; the facilities seem to suggest a designated crosswalk because of a median with a paved patch of sidewalk. However, there are no crosswalks and no curb cuts leading to the median. This median is shown in Figure 37. As pedestrians cross here, they are presented with fast-moving traffic with poor visibility, putting them in danger.

Figure 36: Potential crossing across Hammond Pond Parkway

b. **Pedestrian Crosswalk with No Facilities Leading Up to It:** There is another designated crosswalk further north on this road, however, there are no facilities leading pedestrians here. This crosswalk is also hazardous as cars are still making the same turn as mentioned above. Hammond Pond Parkway consists of four lanes of fast moving traffic, presenting a hazardous crossing regardless of having the facility. Designating a crosswalk on a steep turn on a hill makes this particularly hazardous.

Recommendation: Renovate or replace existing facilities. We recommend that these facilities be repaired, replaced, or otherwise built to ADA regulations, providing the proper widths, even surfaces, and curb cuts with crosswalks leading up to them. Signalizing the crosswalks along Hammond Pond Parkway would also be beneficial to pedestrian safety.

5. **Pedestrians Use Underpass to Cross Route 9 without Facilities:** During our observations, many pedestrians were walking through the underpass without any designated facilities. The underpass is shown in Figure 38. To identify the reason for this, we observed where they were traveling. Some were walking through the underpass to use the crosswalks on the other side of Route 9 to cross Hammond Pond Parkway. Others were using the underpass to get from one side of Route 9 to the other. These paths are shown in Figure 39. Regardless of where they were traveling, using this underpass is extremely hazardous because it only provides a very narrow place to walk with cars traveling quickly around a sharp corner from Route 9. This area is likely to cause an accident between motorists and pedestrians.

Figure 37: Route 9 Underpass

Recommendation: Discourage the use of these facilities. We recommend that pedestrians should be discouraged from using this underpass. This can be done by encouraging people to use the crossings along Route 9 through signage. These signs will outline where pedestrians can get from the north side of Route 9 to the south side safely

Recommendation: Install pedestrian facilities along the underpass of Route 9. To solve this safety issue, new facilities need to be built to accommodate the pedestrians crossing through this underpass. In order to fit in new sidewalks and other facilities, the lanes through the underpass need to be narrowed. Narrowing street lanes is considered a method of traffic calming, which slows down traffic, also benefiting pedestrian safety.

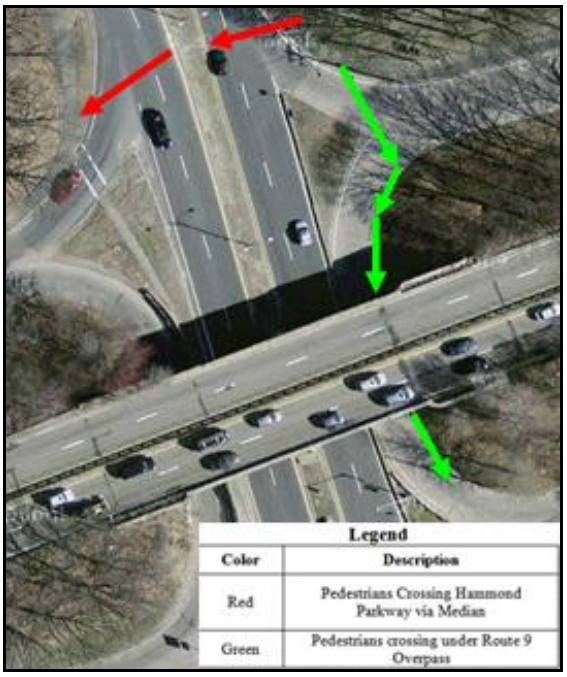

Figure 38: Map of Hammond Pond Parkway Unsafe Pedestrian Patterns

Summary of Chestnut Hill Recommendations

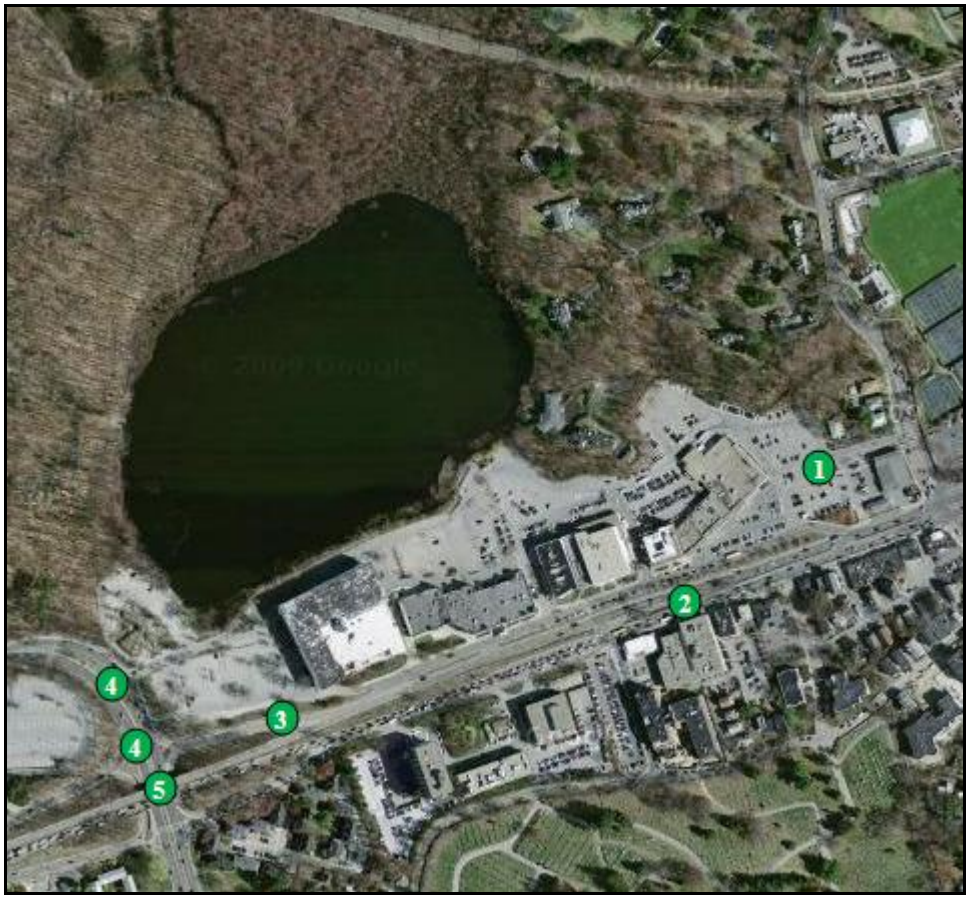

Figure 39: Chestnut Hill Recommendations Map

Location on Fig. X	Recommendation	Cost	Impact
1	Install crosswalks	Low	High
2	Remove the crosswalk	Low	High
	Implement the walking light	High	High
3	Replace existing facilities	High	High
4	Renovate or replace existing facilities	High	High
5	Discourage the use of these facilities	Low	Low

5 Summary and Next Steps

In this section, we summarize high priority improvements for pedestrian mobility, both throughout Newton and in each study area. Many of these improvements will be relatively inexpensive and simple to implement, yet can have a significant impact on increasing pedestrian mobility. We also present some more expensive improvements that can have a greater positive impact on pedestrian mobility.

Short-term recommendations are those that are less costly and can be implemented easily and without much further planning. Below we present our short-term recommendations for each area.

West Newton Short-Term Recommendations:

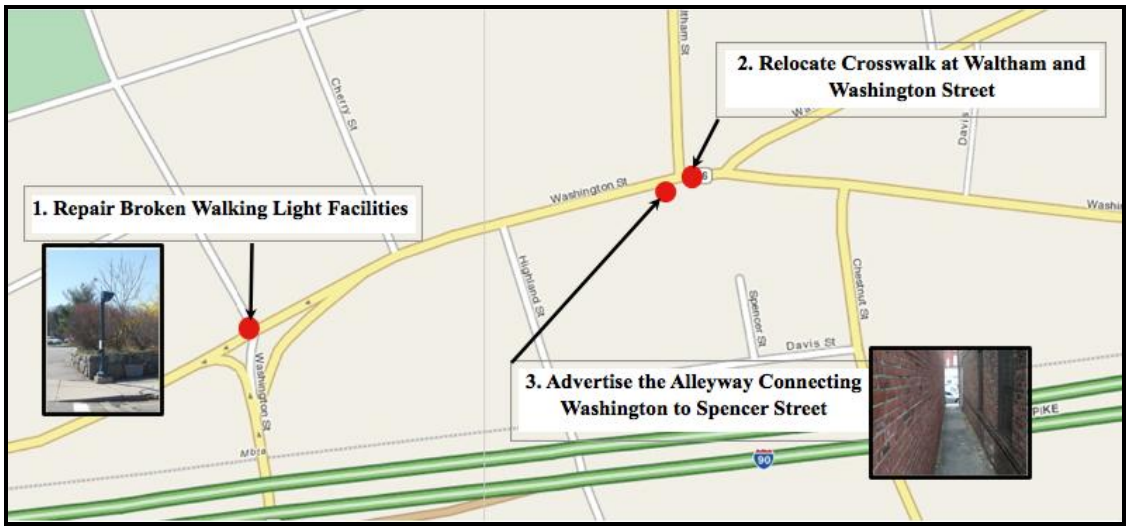

Figure 40: Map of West Newton Short-Term Recommendations

1. **Repair Broken Walking Light Facilities:** At the intersection of Elm Street and Washington Street, there is a walking light that is not visible to pedestrians and there is a button for a walking light that is not functional. Fixing these two facilities will help improve pedestrians' safety.

2. **Relocate Crosswalk at Waltham and Washington Street:** The crosswalk across Washington Street at Waltham Street should be moved from one side to the other. Moving this crosswalk will allow pedestrians a safer crossing providing a refuge for pedestrians with a median and by avoiding hazards such as right-on-reds.

3. **Advertise the Alleyway Connecting Washington to Spencer Street:** This alleyway is very conveniently located, but because it is hidden and not aesthetically pleasing, it is often unused. Improving the alley's aesthetics and advertising its public use with signage

cuts pedestrians' commutes significantly and allows access to shops along Spencer Street. It also will increase safety by cutting down the interaction time between pedestrians and vehicles.

Newton Corner Short Term Recommendations:

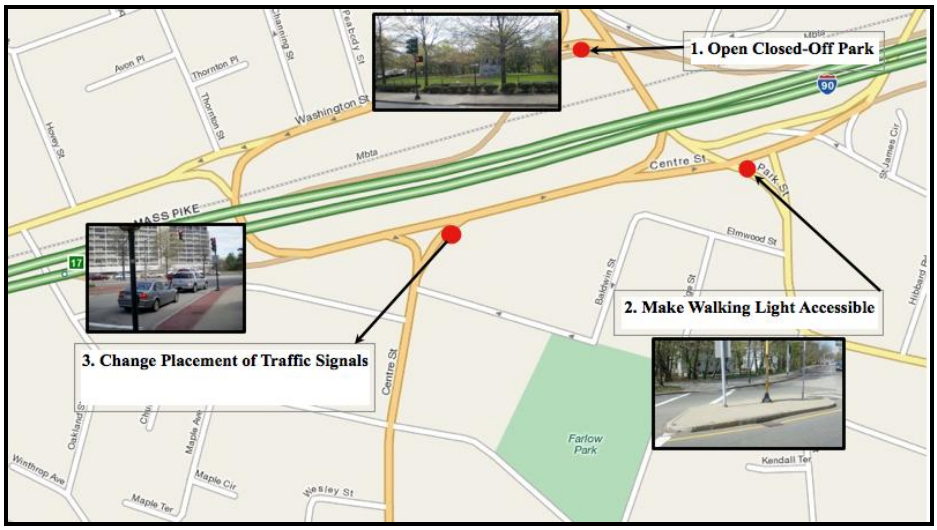

Figure 41: Map of Newton Corner Short-Term Recommendations

1. **Open Closed-Off Park:** On the north side of Newton Corner, there is a green, open space that is closed off by a fence. This park is a memorial containing a bell from a former fire station. Opening this park would provide a safe and inviting destination for pedestrians.

2. **Make Walking Light Accessible:** After being fixed, the walking light on Park Street needs to be moved to the edge of the median, putting it within arm's reach of the lowered cut-through. This will provide a safe and accessible means of travel, especially for the children using this as a route to school.

3. **Change Placement of Traffic Signals:** In order to improve the safety of crossing the intersection of Centre Street and Centre Avenue, relocating and removing some traffic lights would reduce the impact from traffic in this area. Currently, there are three traffic lights at this intersection. Two exist on either side of Centre Street after a crosswalk and the other exists in the median before the crosswalk. We recommend removing both lights after the crosswalk and adding another light on the other side. This will result in cars stopping before the crosswalk instead of on top of it, decreasing the interaction time between motorists and pedestrians, increasing safety for pedestrians at this intersection.

Newton Centre Short-Term Recommendations:

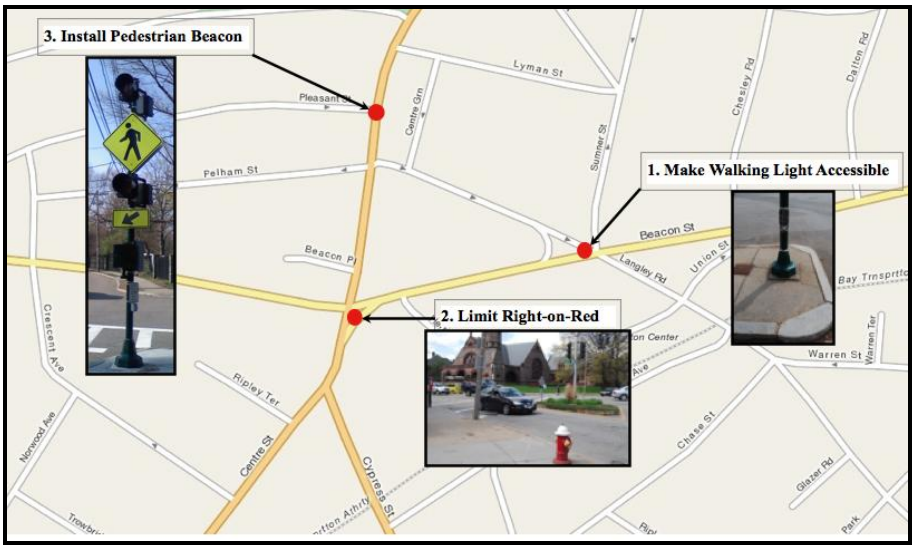

Figure 42: Map of Newton Centre Short-Term Recommendations

1. **Make Walking Light Accessible:** There is a walking light located at the end of Langley Road right before it begins to intersect with Sumner Street and Beacon Street. This walking light is located on a median which currently possesses no curb cut. This makes the walking light inaccessible. Installing a curb cut located at this median will allow all people, regardless of disabilities, to use the walking light to cross the street safely.

2. **Limit Right-on-Red:** Some motorists driving north on Centre Street making rights-on-red onto Beacon Street take this turn at relatively high speeds. This endangers pedestrians when using the walking light because despite the safety that these lights provide, motorists taking the right-on-red do not yield or see pedestrians attempting to cross. The installation of a traffic signal stating, "No Turn on Red" should be implemented at this intersection. This light will only appear when pedestrians use the walking light to cross Beacon Street. Installing this light will increase the safety for pedestrians crossing by increasing driver awareness.

3. **Install Pedestrian Beacon:** Pedestrian beacons make crosswalks safer by making motorists more aware of the pedestrians in the area. After determining that the beacon is effective in notifying motorists of pedestrians, we recommend that a beacon be installed at the Pleasant Street crosswalk on Centre Street. This crosswalk exhibits heavy pedestrian traffic and is also located on a hill, which may affect the visibility of motorists when traveling up it.

Chestnut Hill Short-Term Recommendations:

Figure 43: Map of Chestnut Hill Recommendations

1. **Install a Traffic Signal and Walking Light at Un-signalized Crossing:** This crossing is located on Route 9, across from Finagle-a-Bagel. Route 9 is unsafe to cross without any help from traffic signals or walking lights. Installing a traffic signal and walking light will increase the safety of pedestrians wishing to cross Route 9.

2. **Implement Accessible Crossing on Hammond Pond Parkway:** Hammond Pond Parkway is unsafe for pedestrians to cross and travel along. Currently, there are many areas that have no pedestrian facilities, causing people to create their own walking routes. Designing and implementing new pedestrian facilities along this parkway will increase the safety of those who choose to walk here.

Below we present our long-term recommendations for each area. These recommendations are more costly and require further study and planning to be implemented.

West Newton Long-Term Recommendations:

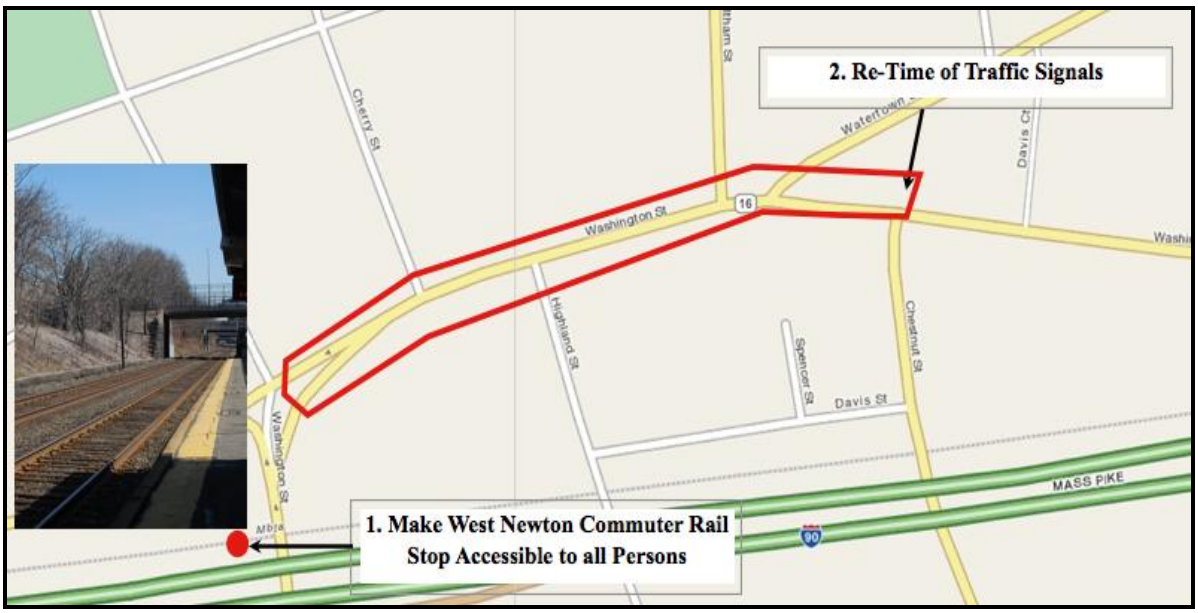

Figure 44: Map of West Newton Long-Term Recommendations

1. **Make West Newton Commuter Rail Stop Accessible to all Persons:** There are three commuter rail stations in Newton, including one in West Newton. Every station is currently inaccessible to many people with disabilities because only a set of stairs provides access to these stations. The city should consider working with the MBTA to create a ramp at least at the station in West Newton. The space provided here is wide enough for development of this facility. This will increase accessibility to mass transit and make West Newton a more pedestrian-friendly environment.

2. **Re-Time of Traffic Signals:** A major problem facing pedestrian mobility in West Newton is the heavy traffic caused by five sequential lights located within a quarter mile on Washington Street. The heavy traffic often causes cars to back up onto crosswalks and creates poor visibility between motorists and pedestrians. Cars on top of crosswalks present safety issues because it forces pedestrians to direct themselves around vehicles. Re-timing the lights will improve traffic flow, helping prevent cars from backing up onto crosswalks.

Newton Corner Long-Term Recommendations:

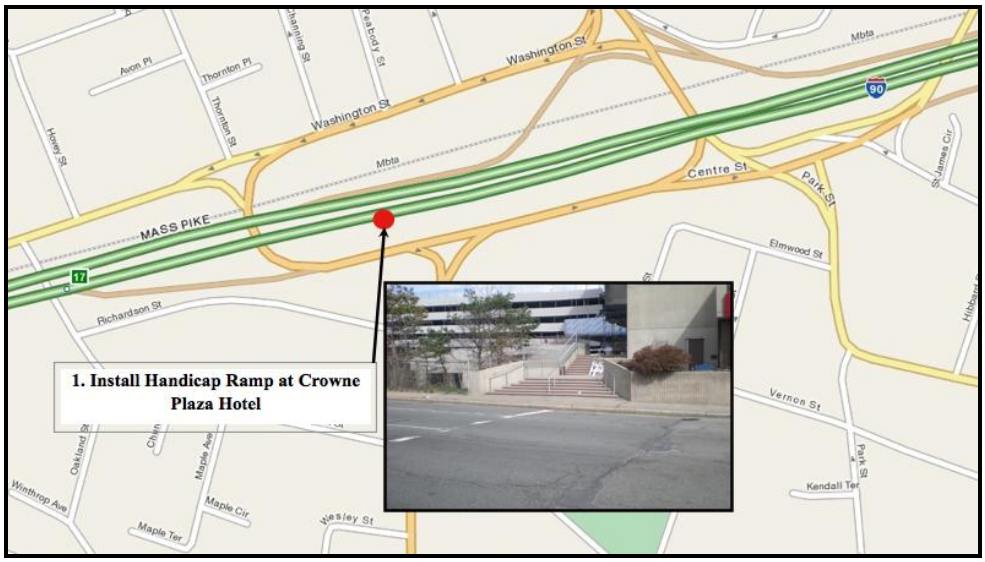

Figure 45: Map of Newton Corner Long-Term Recommendations

1. **Install Handicap Ramp at Crowne Plaza Hotel:** On the south side of the Crowne Plaza path over the Massachusetts Turnpike is a stairway. These stairs prevent those with disabilities to cut-through this area as a safe means to cross over the Massachusetts Turnpike. We recommend implementing a ramp at this location. This will be expensive and require planning in conjunction with the Massachusetts Department of Transportation as well as the hotel; however this will greatly increase accessibility in this area.

Newton Centre Long Term Recommendations:

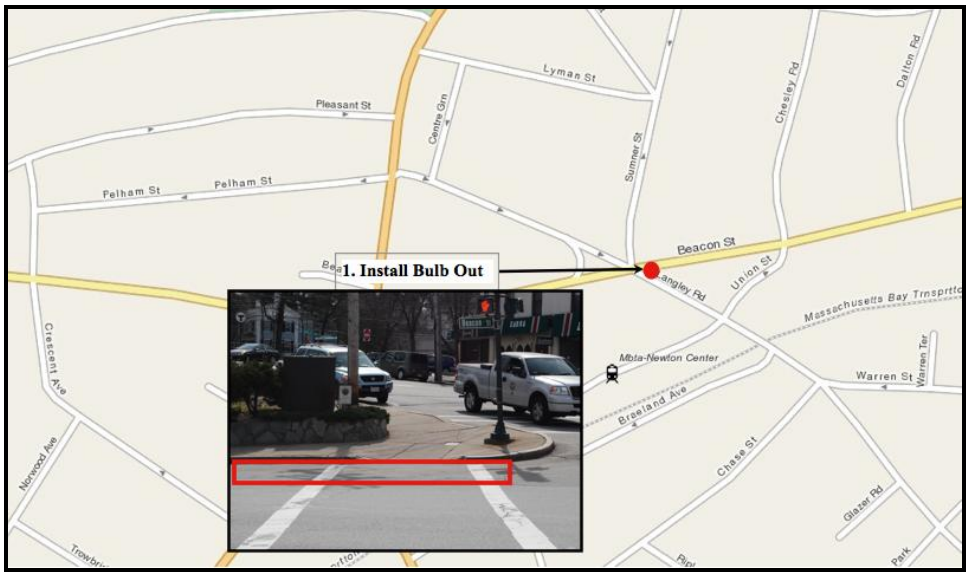

Figure 46: Map of Newton Centre Long-Term Recommendations

1. **Install Bulb Out:** At the Langley Road and Beacon Street intersection, there is an extremely long crosswalk that leads to a curb cut and median. The median is at such an incline that people with walking disabilities avoid this area. Installation of a bulb out, which requires extending the sidewalk into the road, will reduce the length of the crosswalk and give ample room to redesign a curb cut and median that will be accessible to all persons. This improvement will increase pedestrian safety when traveling within this intersection.

Chestnut Hill Long-Term Recommendations:

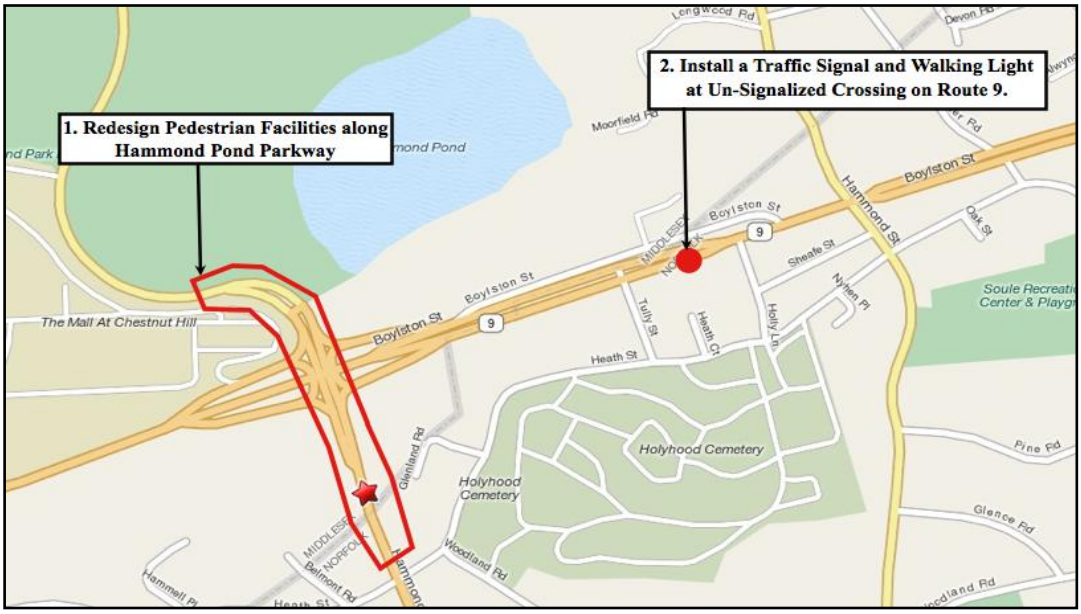

Figure 47: Map of Chestnut Hill Long-Term Recommendations

1. **Install a traffic signal and walking light at un-signalized crossing on Route 9.** Installing a traffic signal and walking light will increase the safety of pedestrians wishing to cross Route 9. This recommendation will require cooperation from Brookline.

2. **Redesign Pedestrian Facilities along Hammond Pond Parkway:** Since Hammond Pond Parkway is very unsafe for pedestrian travel, a redesign of the area, including the intersection with Route 9 and travel north to the mall entrance, should be considered. This could allow for the construction of new pedestrian facilities along this route, such as the implementation of a sidewalk on the side of the street closest to the Shopping Center and some traffic lights equipped with crosswalks and walking signals. This would make the area where the parkway meets Route 9 much safer for both pedestrians and motorists.

Citywide Recommendations:

- **Replace Brick Walkways with Pressed Concrete:** Brick can be a hazardous surface therefore as it degrades pressed concrete should be used as a replacement. Pressed concrete is a cheaper and safer material and still possesses much of the same aesthetics as brick.

- **Improve Crosswalk Painting:** In order to improve crosswalk painting, hatching or solid colors should be used. These will improve visibility and therefore the safety of pedestrians.

- **Improve Bus Stops:** At bus stops throughout the city, where able, full shelters and bike racks should be added. These will increase aesthetics and also encourage the use of these stops.

- **Install Curb Cuts for Each Crosswalk:** A common regulation violation that we found during our work in Newton was one curb cut that accommodated more than one crosswalk. According to the American with Disabilities Act, each crosswalk must have its own curb cut, meaning it cannot be shared with another crosswalk. By installing curb cuts at each crosswalk location, this will help ensure safe and accessible pedestrian crossings.

- **Install Perpendicular Crosswalks at Intersections:** Throughout the four study areas, we noticed many crosswalks that are diagonal. Diagonal crosswalks can be more convenient for pedestrians because they could provide a more direct path to their destinations. However, these present a serious safety issue, because diagonal crosswalks cause longer interaction time between motorists and pedestrians. Due to this, curb cuts should be installed directly across from one another in order to allow a straight crosswalk for pedestrians.

- **Install Medians in Necessary Locations to avoid Long Crosswalks:** Newton has several intersections that exhibit heavy pedestrian and vehicular traffic. This congestion may require several street lanes that allows for easier flow of traffic, which causes crosswalks to become extremely long. In all locations, long periods of pedestrian-vehicle interaction should be avoided to help improve pedestrian mobility, as stated by the MPO. Installing medians at crosswalks that are long will provide safety for pedestrians by allowing a place in the middle of the crosswalk to separate the pedestrian from vehicular traffic.

- **Right-on-Red:** Right-on-red turns present a safety issue to pedestrians, even when using the walking light. Our recommendation to those right-on-red turns that present challenges to pedestrians are eliminating the right-on-red turn, installing a traffic signal that reads "No Turn on Red" when the walking light is in use, or implementing *leading interval lights* that will provide a buffer for the pedestrian to cross lanes before vehicular travel in any direction can begin again.

- **Earlier Seasonal Maintenance:** Sidewalks and crosswalks should be maintained earlier in the spring. This will minimize the time that debris and poor visibility affect safety and accessibility in Newton. This recommendation is directed towards Newton's Department of Public Works, who is responsible for the maintenance and upkeep of these facilities.

In this report, we have identified challenges and opportunities concerning pedestrian mobility in four villages of Newton, and have provided recommendations for each area intended to promote safe pedestrian activity. We hope these recommendations will aid Newton's efforts to creating more walkable environments. Enhanced pedestrian mobility can benefit residents, tourists, and business owners within each study area, thereby improving quality of life in the city.

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Appendix A: ADA Regulations

This appendix includes the legal and regulatory requirements for various pedestrian facilities, including sidewalks, crosswalks, curb cuts, and walking lights as outlined by the ADA. Some of the required dimensions of pedestrian facilities are displayed the table below.

Table 2: Required Dimensions for Pedestrian Facilities (ADA)

Required Dimensions for Pedestrian Facilities			
Facility	**Max Width (ft)**	**Grade (%)**	**Truncated Domes Required**
Curb Cut	4	8.3	Yes
Ramp Landing	4x4	2	Yes
Sidewalk	4	2 (Cross)/ 5 (Running)	N/A
Sidewalks/Driveways	3.5	2	N/A
Path/Trails	N/A	5	Yes
Crosswalks	6	N/A	Yes

Here are the requirements for constructing and maintaining sidewalks. When constructing a sidewalk, the ADA requires an unobstructed minimum width of three feet, however, if there are obstructions on the sidewalk the minimum width of the facility must be five feet. In addition, there must be a ten foot long and five foot wide passing point at a maximum of every 200 feet of sidewalk (ADA, 2000). Also, areas with sidewalks that have no buffer between pedestrians and vehicular traffic must be six feet in width, and commercial areas with sidewalks must have a width of eight feet. Passing points on sidewalks are required in order to allow comfortable travel for many disabled pedestrians, which is why there are different required widths depending upon the area (Boston MPO, 2008). Places for resting are required for sidewalks with a steep slope, which is defined as exceeding a five percent grade. These are flat areas of sidewalks that must be spaced at a maximum distance of 400 feet (SANDAG, 2002). The ADA also has considerations for maintaining the accessibility of sidewalks. All sidewalks and curb cuts must be clear of snow allowing at least the legal minimum width for travel. Additional concerns for sidewalks in place are cracks and uneven surfaces. Cracks or gaps in the sidewalk cannot be larger than a quarter inch. Also, changes in level have to be ramped if they exceed a half inch rise. Gaps and level changes must be repaired to avoid potential tripping hazardous and inaccessible conditions for the elderly and disabled (SANDAG, 2002).

The requirements for constructing and maintaining crosswalks are also described by the ADA. When painting crosswalk markings, sand should be added to the paint or thermoplastic to increase slip resistance. In addition, crosswalks need to remain visible and therefore they need to be routinely, depending on the how quickly they fade, repainted (Sasidharan et. all, 2009). Re-painting of crosswalks typically takes place in the spring because most of the corrosions occur during the fall and winter seasons due to sand and salt applied to icy roads. Other than this, the design for crosswalks through medians should be at least six feet long (SANDAG, 2002). The

ADA does not require but recommends that tactile warnings such as wayfinding strips, and tactile bumps are used along crosswalks. Tactile warnings are a "change in surface condition providing a tactile cue to alert visually impaired pedestrians of a potentially hazardous situation" (SANDAG, 2002). Wayfinding strips are grooves that lead can a visually impaired pedestrian through a crosswalk while tactile bumps are bumps used to define both of the edges of a crosswalk (SANDAG, 2002).

There are also many requirements for the design of curb cuts. When designing a median, curb cuts need to be included to allow access onto it when there is no crosswalk through it. These curb cuts should be a minimum of four feet wide (Boston MPO, 2008). At each corner of an intersection, there are two curb cuts that must align with its own crosswalks. When placing curb cuts, storm drainage inlets should be placed on the uphill side of curb cuts to prevent pooling of water. Another construction concern is if the slope of a curb cut exceeds five percent, handrails are required. The construction of curb cuts requires truncated domes. Truncated domes are pads on curb cuts which have "small domes with flattened tops used as tactile warnings" (SANDAG, 2002).

Other guidelines of pedestrian facilities that are enforced by the ADA are regulations regarding signs, stop lines, and medians. Signs are an effective was of warning drivers of pedestrian crossings, signs like *State-Law-Yield-to-Pedestrians* are considered the most effective (ADA). Signs near schools are important also. Stop lines should be a minimum of four feet before crosswalks indicating where motorists should stop allowing the pedestrian to feel safe to cross (ADA). Stop lines are not required at all intersections but are crucial on multilane roads. Medians must be at least six feet wide and must be implemented at crosswalks that are longer than fifty feet (ADA).

Finally, the ADA has requirements for accessible signal controls allowing all people the ability to use them despite any disability. Audible signals and Braille instructions are to be used at pushbuttons. The placement of the pushbutton should be accessible. This means that they cannot be higher than three feet off the ground and should be located in close proximity to the curb cuts. Also, signals that allow pedestrians to cross are crucial with areas of high traffic and must provide pedestrians to cross the distance of the road at 3.5 feet per second (Boston MPO, 2008). This time is ideally allotted in the walk stage before the flashing *Do Not Walk* stage begins even though both are safe during walking.

Appendix B: Pedestrian Infrastructure Identification Forms

Name: Caitlyn, Cory, Jeff, and Michael

Date: 4/ /10

Location: West Newton

Location #	Nature of Pedestrian Infrastructure
The specific location of a problem with pedestrian infrastructure is based upon a number that is located on the GIS map of the area.	This describes the pedestrian infrastructure and what is wrong with it. Ex. Faded crosswalk, not visible by motorists due to faded lines.
1	Poor sidewalk conditions; unevenness of sidewalk is higher than 1”
2	Condition of brick buffer is poor
3	Long crosswalk; potential extended median
4	Shared curb cut
5	Turn onto Watertown St. on sidewalk very sharp; could be difficult for disabled to travel
6	Parking for piano studio sticks into sidewalk
7	No crosswalks on Watertown St.
8	Right-on-red is dangerous when using walking light
9	Possibility for extended median through crosswalk
10	Long crosswalk
11	Short walking light; shared curb cut
12	Long crosswalk
13	Narrow sidewalk, < 4 ft.
14	Not maintained well; not aesthetically pleasing

Location #	Nature of Pedestrian Infrastructure
15	Broken sidewalk
16	Two shared curb cuts
17	Faulty walking light; does not change to walking signal
18	Intersection has confusing series of crosswalks; potential for more direct crosswalk
19	Walking light facing wrong direction
20	Inaccessible commuter rail stop; only has stairs

Name: Caitlyn, Cory, Jeff, and Michael

Date: 4/1/10

Location: Newton Corner

Location #	Nature of Pedestrian Infrastructure
The specific location of a problem with pedestrian infrastructure is based upon a number that is located on the GIS map of the area.	This describes the pedestrian infrastructure and what is wrong with it. Ex. Faded crosswalk, not visible by motorists due to faded lines.
1	Missing concrete on sidewalk
2	Narrow, unclean, exposed sidewalk
3	Grade of curb cut exceeds regulations
4	Walking light did not turn on, long wait
5	Crosswalk faces away from traffic, not perpendicular to road
6	South side entrance to hotel walkway, not handicap accessible
7	Area is not handicap accessible
8	Uneven sidewalk, more than 1” difference in level
9	North side entrance to hotel walkway, sidewalk is cutoff by pavement, faded crosswalk
10	Vacant concrete area, unutilized, potential for benches
11	Fenced off park, potential for pedestrian area
12	Very long crosswalk not perpendicular to sidewalk
13	2 crosswalks associated with 1 curb cut
14	Missing brick from curb cut, faded crosswalk
15	Steep curb cuts
16	No crosswalk
17	No means of crossing road
18	Walking button is out of reach from the curb cut

Location #	Nature of Pedestrian Infrastructure
19	Right turn makes crossing dangerous
20	Button not handicap accessible
21	Missing walking button
22	Slanted crosswalks
23	Tree obstructing movement on sidewalk
24	Traffic sign for I-90 obstructing movement on sidewalk
25	Shared curb cut, sidewalk is in poor condition, pedestrian signs after crosswalk
26	Sidewalk ends and there is no crosswalk
27	Crosswalks are faded, pavement in poor condition, inaccessible walking button, steep curb cut
28	Curb cut is small and off center of crosswalk

Name: Cory, Caitlyn, and Michael

Date: 3/25/10

Location: Newton Centre

Location #	Nature of Pedestrian Infrastructure
The specific location of a problem with pedestrian infrastructure is based upon a number that is located on the GIS map of the area.	This describes the pedestrian infrastructure and what is wrong with it. Ex. Faded crosswalk, not visible by motorists due to faded lines.
1	Faded crosswalk; Crosswalk is also not perpendicular to streets (angled).
2	2 Faded crosswalks; 1 curb cut for 1 intersection.
3	Increased incline of sidewalk, making walking conditions difficult for those with wheelchairs or other disabilities.
4	Short crossing light; Angled crosswalk.
5	Crossing butting is hard to access if in wheelchair, it is located on a median and there is no curb cut leading to it.
6	Angled crosswalk.
7	No crosswalk Possible curb extensions for highlighted area in white paint.
8	Missing concrete and curb.
9	No crosswalks, no benches; Only trees and parking meters on sidewalks, very unappealing.
10	No crosswalk.
11	Missing sidewalk; also no curb cut or crosswalk.
12	No marked crosswalk Stop line is after curb cuts Poor visibility of stop sign (parking in front of it).
13	No marked pavement in fire department driveway to notify people of a place to walk (act as a sidewalk).
14	Faded crosswalks Beacon did not “beep” to cross.
15	Faded crosswalks Not perpendicular to sidewalks No curb cuts.

Location #	Nature of Pedestrian Infrastructure
16	Small width of curb cuts Poor pavement conditions.
17	Crooked crosswalk 1 curb cut for 2 intersections Preferred beacon site.
18	Poor conditions of curb cuts, they do not face the crosswalk.
19	Not very attractive or inviting for pedestrians to come and walk.
20	2 newly installed curb cuts, but no crosswalk.
21	2 curb cuts, no crosswalk.
22	If the area near it is going to be developed, then sidewalks should be on both sides of the street.
23	No curbs (missing in some parts).
24	No crosswalk from Walgreen's to parking lot across the street, many people cross in this area to get to PL.
25	Sidewalks cut out from entrance to parking lot (this is a problem for all entrances to the parking lot).
26	Long crosswalks 2 crosswalks for 1 curb cut.
27	End of commercial buildings Possible crosswalk implementation here.
28	Faded crosswalk and lane dividers.
29	No benches underneath bus shelters.
30	Faded crosswalks 2 intersections for 1 curb cut.
31	Tree routes causing tripping hazards in the brick path.
32	New facilities installed, no benches though, it looks like a good place to sit, nice area.
33	Crosswalk not perpendicular to sidewalks, crosswalk only indicated by only 2 white lines.
34	Faded crosswalk; 2 crosswalks for 1 curb cut.
35	Tiny sidewalk (width); poor maintenance.
36	This area is undergoing construction and improvements are being made (3/25/10).

Location #	Nature of Pedestrian Infrastructure
37	To avoid long wheelchair ramp, possible stairs could be implemented to avoid this.

Name: Cory, Caitlyn, Jeff, and Michael

Date: 4/1/10

Location: Chestnut Hill/Route 9

Location #	Nature of Pedestrian Infrastructure
The specific location of a problem with pedestrian infrastructure is based upon a number that is located on the GIS map of the area.	This describes the pedestrian infrastructure and what is wrong with it. Ex. Faded crosswalk, not visible by motorists due to faded lines.
1	Uneven and cracked sidewalk
2	Faded crosswalk; also, two crosswalks to one curb cut
3	No crosswalk for side entrance to Shopping Center; possible place for pedestrian walkway
4	Long crosswalks; shared curb cut; no audible signal for disabled
5	Dangerous crosswalk; no beacon/walking light for pedestrian crossing
6	No curb cuts for crosswalks in parking lots of Star Market
7	Short crossing light for very long crosswalk
8	Missing crosswalk
9	Old, overgrown sidewalk with no curb cuts
10	Missing crosswalk at end of poorly maintained sidewalk
11	Faded crosswalk
12	Faded crosswalk; no walking light or beacon

Appendix C: Observation Identification Forms

Study Area: West Newton

Date: 4/6/10

Location or Intersection	Number of Instances Observed	Actions Observed
Washington Street and Elm Street	21	Pedestrians do not follow the confusing array of crosswalks at this intersection; tend to create their own paths
"	6	Many pedestrians do not use or wait for walking signals at crosswalk on Elm Street; walking button also does not work properly
"	1	Conflict between pedestrian and car making a right-on-red
"	0	No one uses the crosswalk in front of Celtic Crust bakery to access medians
Washington Street and Cherry Street	2	Pedestrian crosses diagonally
"	19	Car blocked crosswalk to Highland Street signals
"	30	Pedestrians and/or cyclists do not use walking signal at Cherry Street
"	48	Pedestrians crossed up Cherry Street without using crosswalk
"	5	Pedestrians crossed Washington Street without walking signal
"	2	Pedestrians crossed Cherry Street using the walking signal
"	5	Pedestrians crossed Washington Street using the walking signal
"	2	Pedestrians push walking signal button and do not wait for change
Washington Street and Waltham Street	6	Pedestrians do not cross using designated crosswalks
"	8	Pedestrians used walking light and crosswalks effectively
"	6	Conflicts between pedestrians and cars making a right-on-red from Waltham Street to Washington Street

Location or Intersection	Number of Instances Observed	Actions Observed
“	n/a	Many people use the alleyway near shops to access cafe
“	n/a	Red lights can cause traffic backup, forcing cars to stop on top of crosswalks
Washington Street and Chestnut Street	n/a	Timing of traffic lights at Chestnut Street can cause cars to back up onto crosswalks and intersection Time from when Chestnut St. light turns green to when Watertown St. light turns green: 32 seconds
“	2	Bicyclists ride on sidewalks
“	1	One pedestrian crossed from across Washington Street from Chestnut Street, and he did not wait for walking light to change
“	n/a	Many do not wait for walking lights to change, or do not use crosswalks
“	7	People crossing across Chestnut Street wait for walking signal to change before crossing

Study Area: Newton Corner

Date: 4/8/10

Location or Intersection	Number of Instances Observed	Actions Observed
Park Street and Centre Avenue	2	Two children walking to school, both use facilities properly
“	n/a	Many vehicles sit on top of crosswalks at Park Street
“	1	Pedestrian runs in front of traffic where Park Street meets Center Avenue
“	2	Pedestrians stopped from crossing due to right-on-red
Centre Avenue and Centre Street	n/a	Many cars stop on top of crosswalks due to traffic light placement and rights-on-red

Study Area: Newton Centre

Date: 4/7/10

Location or Intersection	Number of Instances Observed	Actions Observed
Centre Street and Bowen Street	Many	Cars stop in intersection and on crosswalks because no cars are entering from side streets (one-ways)
"	1	Woman had a hard time getting stroller up onto sidewalk when using curb cut
"	1	Conflict between pedestrian and car making a right-on-red
"	n/a	Faded crosswalks and lack of signage for drivers
"	n/a	Park nearby has no benches, not very appealing
"	2	Bus stop with no shelter
"	n/a	Traffic signal always green unless walking light is activated
Beacon Street and Centre Street	17	Pedestrians crossed south crosswalk with no signal
"	15	Pedestrians crossed east crosswalk without signal
"	47	Pedestrians crossed north crosswalk without signal
"	18	Pedestrians crossed west crosswalk without signal
"	1	Pedestrian almost hit by car making a right-on-red
"	12	Pedestrians cross diagonally through intersection
Beacon Street and Langley Road	Many	Cars traveling west on Beacon Street going onto Langley Road stop on crosswalks
"	Many	Pedestrians do not wait for walking light due to cars on crosswalks

Study Area: Chestnut Hill/Route 9

Date: 4/14/10

Location or Intersection	Number of Instances Observed	Actions Observed
Hammond Pond Parkway and Route 9	19	Pedestrians cross over Route 9 to access sidewalk next to Shopping Center
"	Many	Pedestrians travel under Route 9 overpass to walk along route 9 EB or towards residential area
"	1	Bicyclist uses sidewalk on east side of Hammond Pond Parkway to access Shopping Center
"	5	Pedestrians cross Hammond Pond Parkway via median
Hammond Street near Shopping Center entrance	15	Pedestrians access shops via driveway into Shopping Center
"	15	Pedestrians use designated walkway to travel through parking lot to shops
"	n/a	Pedestrians do not cross behind shops to access them; many cut through parking lot to storefronts

Appendix D: Interview Summaries

Who: Alderman Ruthanne Fuller/Verne Vance (Chestnut Hill/Route 9)
Interview done by: Cory Alemian, Michael Oliveri, Caitlyn Shaddock

Information:

- Ruthanne Fuller and Verne Vance really emphasized on focusing our project on the existing problems in the Chestnut Hill/Route 9 area. They believe that our recommendations will be more effective if directed towards the conditions of the pedestrian facilities in this area.
- They described that it is dangerous to walk along Route 9 near the Chestnut Hill Mall. The open exposure to traffic is not safe for pedestrians when traveling along this area.
- During the interview, we also were introduced to the idea of a shuttle bus, potentially from the Atrium to Chestnut Hill Mall to the Chestnut Hill Green Line T stop.

Who: Alderman Vicky Danberg (Newton Centre)
Interview done by: Cory Alemian, Michael Oliveri, Caitlyn Shaddock

Information:

3. Vicky Danberg introduced "smart growth" during the interview which included improving the aesthetic appeal of the parking lot located in the middle of Newton Centre. She would really like to see improvements of this area by removing the parking lot, she stated that this parking lot causes problems for motorists and traffic because constantly throughout the day vehicles are entering and exiting this parking lot.

4. She also brought to our attention small alley ways located across from the Newton Centre Green Line T stop. She stressed that if these alley ways are made more appealing to pedestrians that people can avoid walking around commercial buildings in order to get to the center of Newton Centre.

Who: Alderman Ted Mess-Mahan (West Newton)
Interview done by: Cory Alemian, Jeff Greenwood, Michael Oliveri, Caitlyn Shaddock

Information:

5. Our interview with Ted Mess-Mahan proved to be very beneficial when recommending improvements for pedestrian mobility in West Newton. We learned that there is no pedestrian ramp that allows access to all persons at the West Newton commuter rail stop.

6. Many motorists take illegal u-turns around the median located at Washington Street and Waltham Street.

7. It is difficult for pedestrians to cross at Elm Street and Washington Street because the width of the road is almost 6 lanes wide.

8. West Newton possesses long crosswalks, which increases the interaction time between pedestrians and motorists.
9. Ted Mess-Mahan was also interested in areas where bike racks can be implemented, also all the bus stops in the area do not have shelters, benches, or bike racks.

Who: Alderman Swiston (Newton Corner/West Newton)
Interview done by: Cory Alemian, Jeff Greenwood, Caitlyn Shaddock

Information: Newton Corner
10. The audio signals located in Newton Corner are confusing the elderly, which presents a large challenges because there is an assisted living home in the area. The complaint is that the audio on the walking light is not clear which confuses those who attempt to cross the street.
11. There is funding in Newton Corner. Seeming that Newton Corner has the Massachusetts Turnpike there must be funding from the state and also there is Marathon funding as well.

Information: West Newton
12. Introduced the idea of smart light which would improve the traffic congestion on Washington Street making it easier for pedestrians to cross the road.
13. There is an inconsistency of sidewalk conditions in this area.
14. Homeowners in Newton must request to have a sidewalk if their property does not have one.
15. Alderman Swiston also informed us of other people that may be helpful or interested in our study.

Who: Kathy Buckley MPO (Newton Centre)
Interviewed done by: Cory Alemian, Jeff Greenwood, Michael Oliveri, Caitlyn Shaddock

Information:
16. Our interview with Kathy Buckley was rather unique. We walked around Newton Centre and actually pointed out challenges to pedestrians and conversed about potential recommendations for the challenges. Some of these recommendations include:
    - **a.** Installing proper placement of curb cuts in order for the painting of perpendicular crosswalks.
    - **b.** Squaring off the right hand turns in order for vehicles to slow down and see pedestrians attempting to cross.
    - **c.** Sidewalks should not break for parking lots and driveways. The sidewalk must remain continuous because it informs motorists that the sidewalk they are driving over is a pedestrian facility and they must be aware that pedestrians may be traveling in this area.

Appendix E: Pedestrian Beacon Testing

In this test, we wanted to determine how often cars would yield or stop for pedestrians trying to use a crosswalk immediately. We compared a crosswalk with a pedestrian beacon to a similar crosswalk without a pedestrian beacon.

Date: 4/12/2010

Time: 4:00pm-4:45

Location with pedestrian beacon Langley Road and Langley Path:

Tester: Caitlyn

1. Car did not stop
2. Cars stopped immediately
3. Car stopped immediately
4. Three cars did not stop
5. Two cars did not stop
6. Cars stopped immediately
7. Car stopped immediately
8. Car did not stop
9. Car stopped immediately
10. Car stopped immediately
11. Cars stopped immediately
12. One car did not stop
13. Cars stopped immediately
14. Car stopped immediately
15. Four cars did not stop
16. Cars stopped immediately
17. Car stopped immediately
18. Car stopped immediately

Tester- Jeff

1. Car did not stop
2. Cars stopped immediately
3. Cars stopped immediately
4. Car stopped immediately
5. Car did not stop
6. One car did not stop
7. One car did not stop
8. One car did not stop
9. Car stopped immediately
10. Car stopped immediately
11. Car stopped immediately
12. One car did not stop
13. Cars stopped immediately
14. One car did not stop
15. One car did not stop
16. One car did not stop
17. One car did not stop
18. One car did not stop

Results: 53% of vehicles stopped immediately

Location without pedestrian beacon Parker Street and Daniel Street:

Tester: Cory

1. One car did not stop
2. Two cars did not stop
3. One car did not stop
4. Cars stopped immediately
5. Two cars did not stop
6. One car did not stop
7. Two cars did not stop
8. Four cars did not stop
9. Cars stopped immediately
10. Two cars did not stop
11. One car did not stop
12. Two cars did not stop
13. One car did not stop
14. Sixteen cars did not stop
15. One car did not stop
16. Five cars did not stop
17. Two cars did not stop
18. One car did not stop
19. Two cars did not stop
20. Five cars did not stop
21. Five cars did not stop
22. Four cars did not stop
23. Four cars did not stop
24. One car did not stop

Tester: Mike

1. Three cars did not stop
2. Ten cars did not stop
3. Cars stopped immediately
4. Two cars did not stop
5. Cars stopped immediately
6. Three cars did not stop
7. Two cars did not stop
8. One car did not stop
9. Two cars did not stop
10. One car did not stop
11. One car did not stop
12. One car did not stop
13. One car did not stop
14. Two cars did not stop
15. One car did not stop
16. Two cars did not stop
17. Four cars did not stop
18. Cars stopped immediately
19. Cars stopped immediately
20. Four cars did not stop
21. One car did not stop
22. Two cars did not stop
23. Two cars did not stop
24. Two cars did not stop

Results: 12.5% of vehicles stopped immediately

Appendix F: Summative Teamwork Assessment

Throughout our work together, we evolved into a more effective group. We chose to follow some principles to do this: be respectful, contribute equal time and effort, and be prepared for work. Once we started practicing and enforcing these principles, the quality of our work vastly improved.

We often reflected on the effectiveness of each other and the group as a whole. For example, we have tried many strategies to effectively produce and edit drafts. The first was to write separate sections and then edit them as a group. However, we noticed that the editing process took far too long using this method. We then tried to improve upon this and edit the sections of the paper individually at the same time and then compile it as a group. We noticed that this process was an improvement; however there was still wasted time. The final method we used was to edit the papers in a sequence, allowing one member to edit a section and then pass it on to another for more editing. This method was much more effective because time was not wasted finding the same edits as other group members.

Another area we work effectively was during group discussions. We had good participation from each member and discussed many issues and challenges that arose during the course of the project. There were disagreements but discussion was kept appropriate, and most of the time everyone was allowed to voice their opinions. We believe that disagreements were "healthy" for our group because it often led to new ideas or concepts that had yet to be addressed. This was seen when determining different strategies to organize our report. We presented evidence to each other for our different opinions and, as a group, decided on the best course of action to take.

An area we could improve for future teamwork experiences would be staying more focused. The good relationships we formed during our work were pleasant. We enjoyed working with one another, which in turn lead to getting off-topic sometimes. Throughout our project, there were a few times when we lost focus and began to talk about other things such as sports, classes we are taking next year or how our weekends were. As a group, we should have reduced how often these diversions happened and also how long they lasted. Reducing, but not eliminating, these diversions would have allowed for more effective working time.